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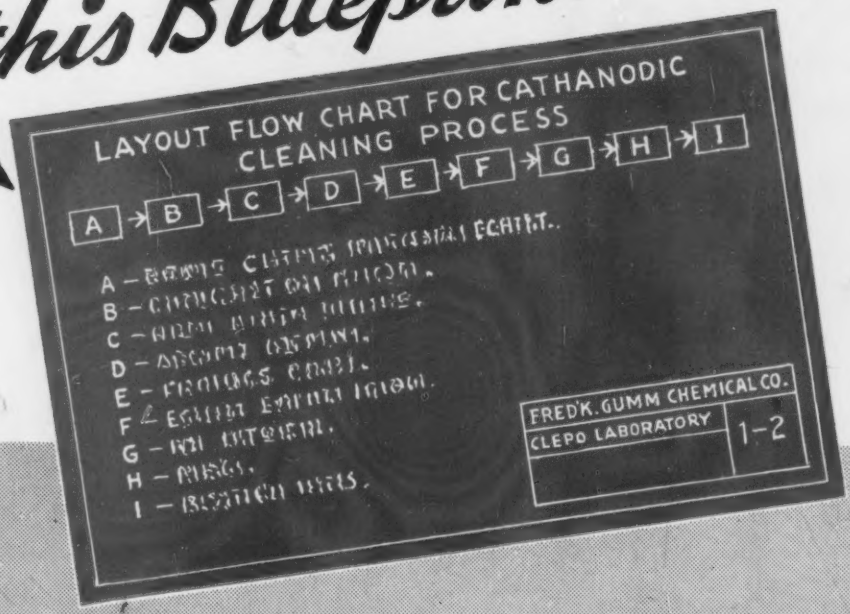

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DEPARTMENTS

. . . YOUR 4TH WAR LOAN QUOTA

WHETHER your plant meets its quota, or fails, lies largely in *your* hands. Your leadership can put it over—but if you haven't already got a smooth running, hard hitting War Loan Organization at work in your plant, there's not a minute to lose.

Take over the active direction of this drive to meet —*and break*—your plant's quota. And see to it that every one of your associates, from plant superintendent to foreman, goes all-out for Victory!

To meet your plant's quota means that you'll have to hold your present Pay-Roll Deduction Plan payments at their all-time high—plus such additional amounts as your local War Finance Committee has assigned to you. In most cases this will mean the sale of *at least* one $100 bond per worker. It means having a fast-cracking sales organization, geared to reach personally and effectively every individual in your plant. And it means hammering right along until you've reached a 100% record in those *extra* $100 —or better—bonds!

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LET'S ALL BACK THE ATTACK!

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VOL. 42, NO. 2 METAL FINISHING FEBRUARY, 1944
PREPARATION, ELECTROPLATING, COATING

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The present campaign to save one million tons of paper and paperboard for war needs can only succeed with the whole-hearted cooperation of industry. Continued paper wastage will result in the issuance of further restrictive orders which will undoubtedly work great hardship, not only on the public, but on industrial users, whose operations have already been cramped to a greater or lesser extent.

Everyone has already been duly impressed by the fact that it takes 25 tons of blueprint paper to make a battleship, but, there is an enormous number of important, though less spectacular requirements for paper in the war effort; 700,000 different kinds of items are shipped to the Army alone—and they're wrapped or boxed in paper.

Each weapon part must be wrapped in greaseproof and in waterproof paper.

Each 500-pound bomb takes 12 lbs. of paper for rings, tops and bottoms.

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How much of our paper production is made available to industry in the near future will depend on our conservation efforts. We feel confident that industry will do its part.

A Method for the Determination of Alumina in Anodic Baths and Other Solutions Containing Hexavalent Chromium

By WINSLOW H. HARTFORD

Research Laboratories, Mutual Chem. Co. of America, Baltimore, Md.

THERE appears to be need for a method for determining alumina in chromic acid anodic baths and similar solutions, suitable for use in routine testing as a complement to the usual gravimetric determination, which is tedious and requires careful removal of interfering constituents for accurate results[1]. Sanz[2] has proposed a potentiometric titration; Sabinina and Kuminova[3] a turbidimetric method for the determination of traces of alumina; and Pavlinova[4] used a procedure depending on the precipitation of calcium aluminate in citrate or tartrate solution.

Manufacturers of aluminum sulfate use a fluoride titration as a means of determining the basicity and alumina content of commercial alums. The method is described in Scott[5] and was used with slight modifications in the present work. It has the advantage of being rapid and not requiring electrometric or other special equipment.

Theory

Aluminum salts react with potassium fluoride solution to precipitate insoluble potassium fluoaluminate which is unaffected by alkali during titration of any free acid which may be present.

$$AlX_3 + 6\,KF \rightarrow 3\,KX + K_3AlF_6$$
$$HX + NaOH \rightarrow NaX + H_2O$$

If no fluoride is added, both aluminum salts and free acid are titratable with caustic, using phenolphthalein indicator:

$$AlX_3 + 3\,NaOH \rightarrow 3\,NaX + Al(OH)_3$$
$$HX + NaOH \rightarrow NaX + H_2O$$

If the above reactions are quantitative, the difference between the alkali titrations with and without the presence of fluoride will correspond to the alumina content of the sample. It would not be expected that the presence of chromate would cause interference unless the precipitates absorb the chromate too strongly and prevent the neutralization of bichromate or chromic acid. Sodium chromate in solution has a pH in the transition range of phenolphthalein[6], and if reasonably dilute should cause little interference.

Reagents

Sodium Hydroxide, 1 N: About 41 g. of C.P. sodium hydroxide are dissolved in sufficient boiled distilled water to make a volume of one liter. If this reagent is to be kept for more than a few days, a small quantity of barium hydroxide may be added to precipitate carbonate and silicate, and the storage bottle should be protected by a soda-lime tube. The solution may be standardized against potassium acid phthalate.

Potassium Fluoride, 50%: 500 g. of C.P. potassium fluoride are dissolved in distilled water which has previously been boiled. A few drops of phenolphthalein indicator are added and the pH of the solution adjusted with dilute alkali or acid until a faint pink color is obtained. The solution is then made up to one liter with boiled distilled water, and stored in a wax or wax-lined bottle to avoid action of the solution in silica:

$$6\,KF + SiO_2 + 2\,H_2O \rightarrow K_2SiF_6 + 4\,KOH$$

Phenolphthalein: The customary 1% phenolphthalein indicator is satisfactory. An additional refinement is the use of a small quantity of thymolphthalein in the indicator to produce a change from colorless to blue-purple, which gives maximum contrast in the presence of chromate.

Experimental

Procedure:

The sample should be distinctly acid, otherwise addition of fluoride will give an alkaline solution before titrating. Excessive acidity, on the other hand, will produce excessively large titrations. Adjustment of the acidity is conveniently made by the use of 1:1 sulfuric acid or 6N silica- and carbonate-free sodium hydroxide. Two equal samples are taken, of 25-50 ml. volume, preferably containing about 0.1-0.3 g. Al_2O_3 and less than 20 milliequivalents of free acid. It will be found that 10 ml. samples of an anodic bath usually meet these requirements without any adjustment, and need only be diluted. To one of the duplicate samples, 20 ml. of the potassium fluoride reagent and 5 drops of the phenolphthalein indicator are added. A white precipitate indicates the presence of alumina. If the indicator changes color before titration it shows that the original sample was not sufficiently acidified, and a fresh, properly adjusted sample should be prepared. Titrate the sample with 1 N NaOH until a change in the indicator occurs which is permanent for 5 minutes.

The second of the duplicate samples is heated to boiling. 5 drops of indicator are added and the sample titrated hot. The endpoint is not as distinct as in the first titration, but is satisfactory. The sample is then boiled again. If the endpoint fades, the titration and boiling are repeated until a permanent endpoint is obtained. The difference between the two titrations corresponds to the alumina in the sample, which is calculated as follows:

(ml. NaOH titration—ml. KF titration) X normality of NaOH X 0.01699 = g. Al_2O_3 in sample.

Data:

The method was first checked with pure aluminum solutions obtained by dissolving National Bureau of Standards melting-point standard aluminum No. 44C [99.97% Al(7)], and "Alcoa" aluminum 2S [99.3% Al], in the calculated amount of hydrochloric acid. The following results were obtained:

Source of Aluminum	Al_2O_3 present, g.	Al_2O_3 found, g.	% error
NBS Melting-point standard	0.1907	0.1919	+0.6
" " "	0.3814	0.3810	—0.1
" " "	0.1875	0.1865	—0.5
" " "	0.4688	0.4695	+0.1
" " "	0.1889	0.1882	—0.4
"Alcoa" Aluminum 2S	0.1968	0.1965	—0.2
" " "	0.1968	0.1967	—0.1

Samples simulating anodic baths were next made up by adding chromic acid to the standard aluminum solutions. The following results were obtained:

CrO_3 present, g.	Al_2O_3 present, g.	Al_2O_3 found, g.	% error
1.000	0.1968	0.1975	+0.4
1.000	0.1968	0.1994	+1.4
2.000	0.0984	0.0994	+1.0
1.500	0.1889	0.1884	—0.3

Finally, a group of anodic baths were analyzed gravimetrically and by the new methods, with the following results:

Sample No.	CrO_3 present, g.	Al_2O_3 present, g.	Al_2O_3 found, g.	% error.
1	0.926	0.1392	0.1391	—0.1
2	1.590	0.2469	0.2468	—0.0
3	0.796	0.0700	0.0695	—0.7
4	0.657	0.0418	0.0414	—1.0
5	1.730	0.0235	0.0231	—1.7
6	1.305	0.0216	0.0209	—3.2

There are included in this group of results three anodic baths of a composition representing normal conditions in a maintained bath[5] as well as three (Nos. 4, 5, 6) in which the alumina has not yet built up to its full value and the ratio of chromic acid to alumina is high. Since the alumina is determined by difference, some falling off in accuracy is to be expected in the latter group.

The effect of impurities in the bath on the results is of interest to the practical analyst. Most of the baths analyzed contained trivalent chromium, in quantities up to 2.0 grams per liter. No interference with the method was noticed, although the endpoint tends to become obscured, and it is believed that about 2.0 grams per liter of Cr^{+++} (calculated as CrO_3) represents a practical limit when a 10 ml. sample is used. No evidence was obtained that the small quantities of copper present in anodic baths cause any interference. Iron, however, forms a complex FeF_6 ion from which hydrous ferric oxide is not completely precipitated under the conditions of the analysis. It therefore interferes seriously, and the method should not be used if more than a trace of iron is present. Fortunately most anodic baths are practically free of iron, but the method is not applicable to the analysis of certain hard chrome plating baths containing alumina.

Discussion of Other Methods:

The work of Sabinina and Kuminova[3] and of Pavlinova[4] was not checked, since the former is principally applicable to traces of alumina, and it was felt that the use of citrates or tartrates as recommended in the latter method, might cause incorrect results through reduction of chromate. On sample No. 4, the method of Sanz[2] gave a figure of 0.0356 g., and error of —15.3%. The error is due to the fact that the precipitate obtained at the endpoint is not pure hydrous alumina, but contains some basic chromate. In this laboratory, we have estimated alumina contents directly from pH by use of the apparent combining ratios described in a previous paper by the author[9]. Because of the experimental nature of the pH-chromic acid function, the method, although reasonably reliable at moderate pH, is not accurate at low pH, and is subject to gross errors when only small quantities of alumina are present. Thus the following results have been obtained:

Sample No.	pH	Al_2O_3 found by pH, g.	% error
1	1.07	0.146	+ 4.8
2	1.03	0.262	+ 6.1
4	0.66	0.076	+85.0

Conclusion

A method has been developed which is acceptable for the routine determination of alumina in the presence of chromic acid, and which is especially suitable for the analysis of anodic baths. When substantial quantities of alumina are present, an accuracy of 1% may be expected, but with small quantities of alumina, the method is somewhat less accurate. Moderate quantities of copper and trivalent chromium do not interfere, but iron is harmful.

The method appears to be more accurate than other rapid methods for the determination of alumina, and does not require the use of any special equipment.

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Corrosion and Its Prevention in the Plating Room

By ALFRED BAECHLIN, JR.

Bayonne, New Jersey

ONE of the most important components of a plating room from the corrosion standpoint is the floor. Here we must have resistance not only to chemical corrosion but also to mechanical abrasion. Since there is a constant overflow of various liquids from the tanks in a plating room it is necessary to provide some means of conducting this to the sewer or other point of disposal. It is difficult to determine the chemical composition of this liquid (which is known as the influent to industrial control manufacturers) since there are many variables depending on which tanks are being operated, what type of cleaning or plating is being done and in what amounts. The chances are that a chemical analysis would never be the same two days in succession. It is safe to say, however, that the composition of this influent will at most times be of a corrosive nature and the amount of floor corrosion affected in its travels from the tank to the disposal point will depend entirely on the anticipation used in the design of the floor and drainage system.

There are three general types of floor drainage systems in use today, namely: individual drains or sumps, trench drains and pitched floor.

Individual Drains or Sumps

This is the older method and is not generally used in modern plating rooms. It has applications, however, where the number of tanks is small and the expense of constructing a highly resistant floor is not justified. There are also applications where the tanks are extremely deep due to the large parts to be cleaned or plated, in which case each tank is set in a large sump of its own. It may be that several tanks will be supported in a single large sump or pit. This method is in use by the aircraft industries where large, deep tanks are often required.

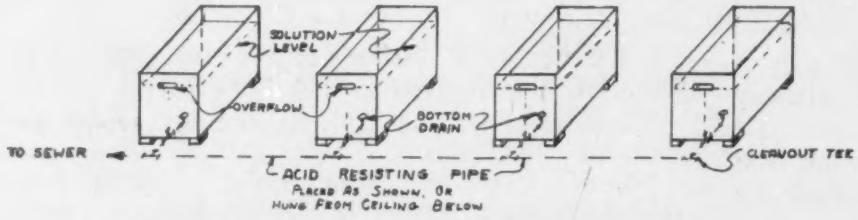


FIG. 1a TYPICAL INSTALLATION OF TANKS PIPED TO DRAIN

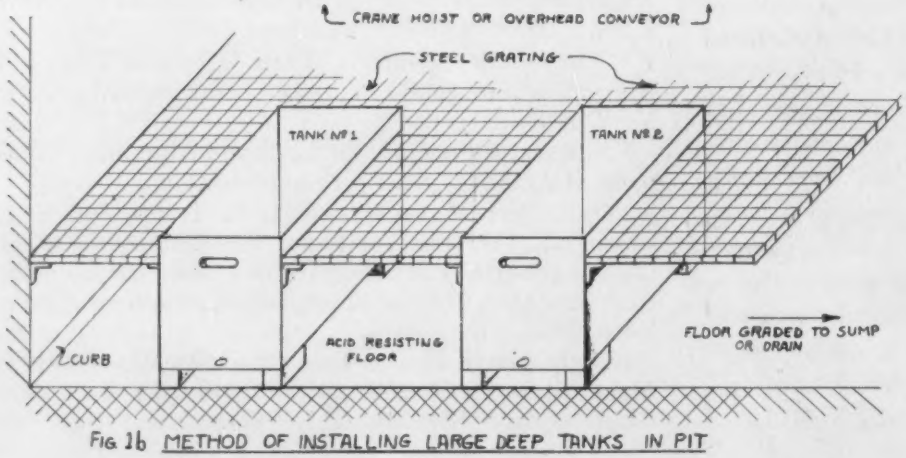


FIG. 1b METHOD OF INSTALLING LARGE DEEP TANKS IN PIT

Frequently there are combinations of the above with a pitched floor or trench.

Where individual drain pipes from each tank are used, it will be necessary to support the piping from the ceiling below, or, if the room is on the ground floor the area underneath will have to be trenched or completely excavated. Some form of acid resisting pipe should be used with special chemical resistant

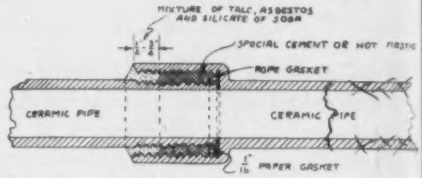


FIG. 2. METHOD OF SEALING CERAMIC PIPE JOINTS

jointing compound. Sometimes welded joints are used but here proper allowance must be made for expansion and contraction. Ceramic, rubber lined, Duriron and Hastelloy pipe and fittings all give good performance against average influent acid and alkali solutions. Since the piping will normally be hung on the ceiling over a working or storage area, it is vitally important that every precaution be taken against the possibility of leaks. For this reason acid and alkali resistant material should always be used in the construction of a drainage system of this sort and there should be frequent supports provided so as not to throw a strain on the joints.

The following table gives a resume of the performance of various metals when subject to attack by acids and alkalies. It was compiled by the writer using information taken from Speller's excellent book on the general subject of corrosion and supplemented by additional data acquired from various manufacturers. This table should provide a quick reference for selecting the proper material to use in piping and outfitting plating rooms.

Relative Corrosion Resistance of Some Common Material in Plating Rooms

Solutions 5—15% Acid Content

	Normal Industrial Atmos.	*Hydrochloric*	*Sulphuric*	*Nitric*	*Acetic*	*Phosphoric*	*8% Alkali Content*
Steel							
Low Carbon (less than 1/10%)	Poor	Poor	Poor	Poor	Poor	Poor	Excel.
Copper steel (¼%)	Fair	Poor	Fair	Poor	Poor	Poor	Excel.
Galv. steel	Good	Poor	Poor	Poor	Poor	Poor	Poor
Nickel steel (28%)	Excel.	Fair	Good	Fair	Poor	—	Excel.
Chromium steel (over 12%)	Good	Poor	Poor	Good	Good	Fair	Excel.
Chromium nickel steel (over 18 & 8%) (Stainless Steel)	Excel.	Poor	Fair	Good	Good	Good	Excel.
Iron							
Wrought	Poor	Poor	Poor	Poor	Poor	Poor	Excel.
Galv.	Good	Poor	Poor	Poor	Poor	Poor	Poor
Gray Cast	Good	Poor	Poor	Fair	Poor	Poor	Good
Silicon (14%) (Duriron)	Excel.	Fair	Excel.	Excel.	Good	Good	Excel.
Nickel Cast. (1%)	Good	Poor	Fair	Fair	—	—	Good
Stellite	Excel.	Fair	Good	Excel.	Good	Excel.	Excel.
Nickel Alloys							
Monel Metal	Good	Fair	Good	Poor	Good	Good	Excel.
Nichrome	Good	Fair	Fair	Fair	Good	Good	Good
Hastelloy	Excel.	Good	Fair	Good	Good	Excel	Excel.
Copper Alloys							
Red Brass	Good	Poor	Fair	Poor	Fair	Fair	Poor
Bronze	Good	Poor	Fair	Poor	Fair	Fair	Fair
Pure Nickel	Good	Good	Good	Poor	Good	Good	Excel.
Pure Copper	Good	Fair	Fair	Poor	Fair	Fair	Fair
Hard Rubber	Excel.	Excel.	Excel.	Fair	Excel.	Excel.	Excel.
Ceramic	Excel.	Excel.	Excel.	Excel.	Excel.	Fair	Good
Glass (Pyrex)	Excel.	Excel.	Excel.	Excel.	Excel.	Fair	Fair
Carbon	Good	Good	Good	Poor	Good	Good	Fair

STAINLESS STEEL sheets are manufactured by the Duriron Company for use in fabricating ductwork subject to corrosion. This material is called Durimet and has a composition of 22% nickel, 19% chromium and 3% molybdenum. It will withstand attack from nearly all acids (see Table) and alkalies without additional protection, but is expensive. At present its use is frowned upon due to its high content of critical materials.

CERAMIC PIPE, made of selected clays and other ceramic raw materials and fired sufficiently long to insure complete vitrification, has extremely high resistance against corrosion in this sort of application. It is mechanically strong, its weight is about half that of cast iron, its cost low and it is made in a large variety of sizes and fittings such as screwed end, or socket end pipe, cross, tee or fittings 45° elbows, traps, etc. It can be readily cut with an abrasive wheel or cold chisel. Joints between pipe and fittings are made by pouring a hot mastic and sealing with asbestos cement.

RUBBER PIPE and rubber lined pipe were frequently used before the war for drainage but are now taboo for most applications. Hard rubber pipe was used for the lower pressures and temperatures and rubber lined steel pipe for the higher temperatures and pressures. Fittings were available in a variety such as mentioned above under ceramic pipe. Joints on hard rubber pipe were screwed and required extreme care if threading was done in the field to guard against leaks. A special pipe joint compound was used on the threads. Hard rubber pipe has the advantage of being considerably lighter in weight than the other materials used in drainage construction. This is an important factor in some kinds of applications. Its cost, however, is over double that of ceramic pipe and it must be rigidly supported throughout its length. Its coefficient of expansion is approximately 0.0005 inches per foot per degree and on long runs provision must be made for expansion and contraction. Hard rubber pipe should not be handled with a Stillson type wrench. This necessitates the use of a strap type wrench. Rubber lined steel pipe has the advantage of extra strength but, of course, its weight is much greater, being about four times that of hard rubber. It need not have rigid support and can be handled with standard tools. Its cost is about the same as hard rubber and it is available in a large variety of sizes above 2". In order to get a continuous protection of rubber, the pipe lengths and all fittings are equipped with integral flanges and the rubber lining is carried over the face of these flanges. Generally speaking, the use of rubber and rubber lined pipe is not to be recommended for plating room drain lines when nitric acid, in which rubber dissolves, is present in high concentration. This is also true of carbon and graphite pipe. Care must be taken in selecting rubber for protection when mixtures of acids are being transported. In cases where only those acids are present which do not readily attack rubber, it is an excellent material to use.

SARAN PIPE. A new thermoplastic developed by the Dow Chemical Co. and known as "Saran" is particularly noteworthy at this time since it is composed of non-strategic materials. This pipe has several outstanding features among which are its excellent stability rating in most concentrated acids, the ease with which it can be welded or threaded, its resistance to abrasion and its light weight as compared to metallic pipe. At the present time it is available in a variety of sizes up to 2" inside diameter.

GLASS PIPING has high chemical stability, permits visibility of the solution as to flow, quality and cleanliness and is made to withstand pressures up to 100 pounds per square inch. It is claimed to be unaffected by rapid temperature changes such as the sudden introduction of steam or hot acids. The principal disadvantage of the pipe is its liability to breakage which, when used as an acid carrier might very well produce a serious safety hazard. Its installation expense, both from a material and labor standpoint, are high. There are many applications, however, aside from plating rooms where this type of pipe is used with great success.

DURIRON PIPE contains a high percentage of silicon which gives it its chemical resistance. Its principal dis-

advantage is that it is extremely brittle and is easily cracked either during installation or due to expansion and contraction if proper allowance is not made. It must be supported at the joints and kept as free from vibration as possible. The selection of proper packing for the joints is important. If the packing used dries up due to the heat of the liquids melting out the lubricant of the packing, it will form a very hard substance together with the lead at the base of the joint. Sulphuric, nitric and hydrochloric acids passing through the pipe will form salts with the lead which will have a tendency to pack into the joint and further destroy the flexibility. At the least strain the joint will then crack. To obviate this trouble, new packings have been developed with a high melting point lubricant and the packing is finished with a heated mixture of 7 lbs. sulphur and 1 lb. graphite which eliminates the former lead backing. In connection with pipe joints (and this applies also to ceramic) there is a corrugated flexible gasket ring available which forms a seal between the bell and spigot. By the use of a special liquid lubricant, a good tight joint is secured which has a great deal of flexibility and remains so indefinitely. This feature is particularly important when considering brittle pipe such as Duriron. Duriron pipe weighs about the same as cast iron pipe and its cost is about twice that of ceramic.

HASTELLOY PIPE and fittings contain nickel and molybdenum which make them too expensive to use for drainage in the average plating room. It is particularly adaptable to handling highly concentrated solutions of hydrochloric or sulphuric acid and the alkalies. It has the other advantages of being easily machined and welded. Its use to date has been mainly for castings used in pumps and other machinery which must pass highly concentrated acid or alkali solutions. It weighs about the same as cast iron.

In the event that special equipment is to be used to neutralize the acids and alkalis from the plating room floor it is important to remember that only the pipe fittings necessary to conduct the influent to the neutralizing sump need be highly resistant to chemical attack. This will often result in a large saving in initial cost. The materials described above are to be used in conducting the liquids before neutralization. After this is properly accomplished so that the controlled effluent does not fall more than 5% below pH 7, practically any standard drain pipe may be used such as clay, cast iron, chrome-nickel iron, etc.

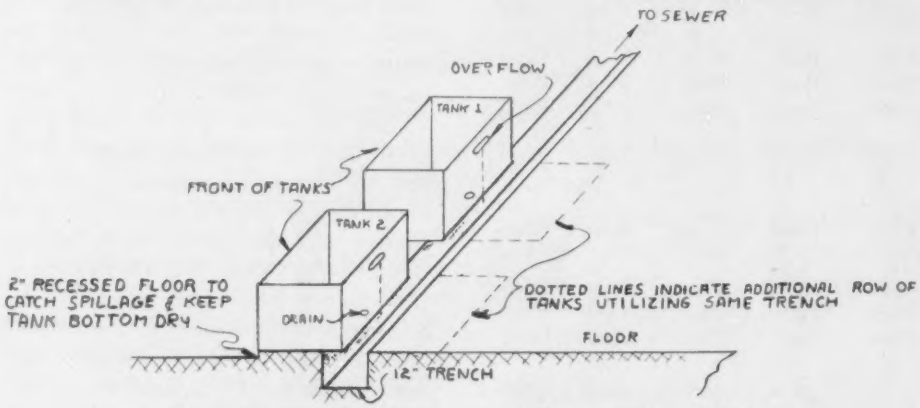


FIG 3 ONE METHOD OF EMPLOYING THE TRENCH DRAIN

Trench Type Floors

Trench type floors are used where it is desired to keep the floor reasonably dry and eliminate gratings or walks. There are many designs in use, depending on the specific application. If the tanks are backed against a wall, the trench extends behind them or there may be a double row of tanks down the center of a room back to back with a trench underneath. There are also plating rooms where a trench extends completely around the room, the floor sloping two ways. It can be stated that the trench method is a sort of combination of the sloping floor and individual drain in that the piping necessary for individual drains is practically eliminated since the influent is confined to the trenches and conducted therein to the sump. The advantages of having a fairly dry floor are also retained. The cost of installing a trench system is greater than the pitched floor type but less than that of the individual drain type if the area and number of tanks is large.

Pitched Floors

The pitched type of floor is generally the most economical and practical one to use providing it fits the application. The sump pit is generally placed in one corner or at the center of one side of the room and the floor is pitched to this point at about $\frac{1}{8}$" to the foot. This type of floor best fits the application where the plating room is on the ground and the sewer drain is sufficiently low so that a reasonably deep sump can be installed. Where the drain is higher than the sump it will be necessary to resort to a pump to raise the liquid to the drain pipe level which means additional cost and maintenance. Where the plating room is on an upper floor this type of system can be installed but it will be necessary to have the sump project down below the floor and to support it rigidly either from the floor below or by means of a hung platform. If the ceiling height does not permit this, it may be better and cheaper to resort to individual tank drains or a number of trench drains, each trench being drained into an individual line to the sewer.

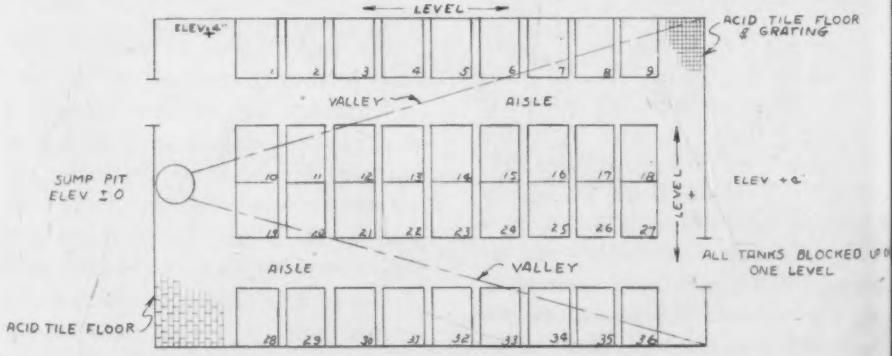


FIG 4. PLATING ROOM WITH FLOOR PITCHING TO SUMP

(To be concluded in March issue)

Electrotinning Steel Strip at Weirton Steel *

Installations of the electrotinning process represent, today, an estimated investment of from $50,000,000 to $60,000,000 in plants throughout the country. These installations are turning out the huge quantities of tin plate essential for the protection of vital foodstuffs.

One of the largest of these installations is at the Weirton Steel Company, Weirton, W. Va. At normal operating speeds it takes, in the largest Weirton line, only eight seconds to plate both sides of a specific section of strip. This is the time required for its passage through the 24 cells of the plating unit. All of these 24 cells are identical. They are trough-like in form, consisting of watertight boxes, five and one-half feet in length along the direction of the production flow, four feet in width and eight inches deep.

The tin bath is operated at a pH of about 2.7 and the most effective temperatures have been found to lie between 100°F. and 160°F., with 150°F. regarded as optimum. At the higher temperatures, of course, higher electrical conductivity is obtained. The current used in the process enters the cells by bus bars connected to 16 pure tin anodes resting on the floor of each cell.

The strip makes contact with the circuit by means of rollers between which the strip enters and leaves each cell. Cells are kept filled from a reservoir containing 15,000 gallons of tin electrolyte. More than 30,000 pounds of tin anodes are required to keep the cells operating. Anodes are replenished manually without halting the line.

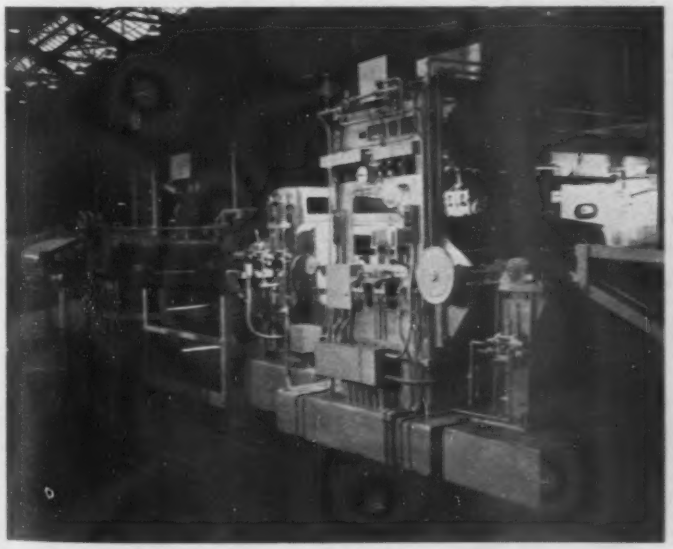
Extensive electric power is required to operate the process at the peak productive capacity. The low voltage direct current equipment is capable of delivering a total of 120,000 amperes to power each plating unit. Voltages of from two to five normally suffice for the operation.

The thickness of the tin coat and the speed with which it is deposited depend on the speed of the movement of the strip through the plating bath and the current density.

The standard unit of measure in the plating industry is the base box, 217.7 square feet of base metal. Since both sides of that area must be coated, the total surface of a base box is 435.4 square feet. Under the necessity of war, it was found possible to reduce the tin deposited per base box by "hot dip" from 1.50 pounds to 1.35 pounds.

Operating at 1,505 feet per minute, one line at Weirton deposits a half-

* Data and photographs courtesy duPont Co.



Flow of strip steel continues uninterrupted ahead of high-frequency electrical induction welder, right center above.

This "pay off" loop feeds the line ahead while a fresh coil of steel is being welded to the trailing end of the line of strip to maintain continuous operation.

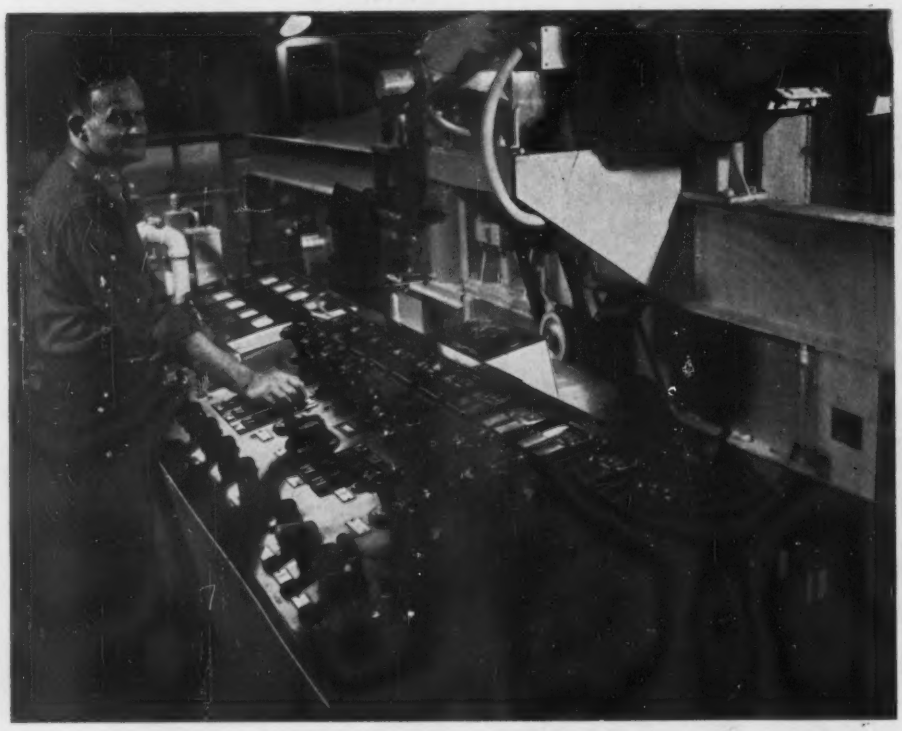
Above—Attendant introducing a new anode of pure tin while steel strip continues to travel through plating cell.

Left—A view showing three-decked units housing the plating cells of three separate continuous electrotinning lines. The central line of this installation at the Weirton Steel Company, Weirton, W. Va., electrotins 1050 feet of strip per minute for the container industry.

Below—Centralized one man control characterizes the equipment.

pound of tin per base box and, by variation of line speed and current density, it has been found entirely possible to deposit as thin a coat as a quarter-pound per base box.

Depositing a half-pound per base box on a continuous strip 32 inches wide requires a current density of 206 amperes per square foot with the line running at 1,000 feet per minute. To deposit three-quarters of a pound of tin per base box, at a line speed of 1,000 feet per minute, requires a current density of 309 amperes per square foot. A current density of 412 amperes per square foot is required to deposit a pound of tin per base box at the 1,000-foot speed.



In performing the half-pound operation, at Weirton, the total current required to be developed by the electrical installation serving this Weirton line is 72,000 amperes. A total of 113,000 amperes is required to accomplish the three-quarter pound operation. To plate a pound of tin per base box at the rate of 800 feet per minute requires a total of 115,200 amperes for the entire battery of 24 plating cells.

In addition to the electroplating proper, equipment to perform other incidental functions is essential to the production of high-quality tin plate. These include units for pre-processing strip prior to electroplating; a heater for bright flowing the tin coating to impart the bright, shining finish familiar on food containers, and the motive units to propel the strip through the line.

Essential elements that maintain the uninterrupted flow of strip are two uncoilers at the start of the line, an electric induction welder and a "pay-off" loop. The uncoilers operate alternately. While strip from a 25,000-pound coil is unwinding from one to feed the production line, the other uncoiler is being loaded with the next coil. The "pay-off" loop avoids the necessity of halting the line when a new coil is being

welded to the strip. It provides sufficient slack to feed the rest of the line while the weld is being made.

From the "pay-off", located in a pit 45 feet deep, the strip passes through an alkaline solution which cleanses the surface of all dirt and grease. The strip next enters the acid pickling bath which removes surface oxides in preparation for the tinning process.

Tinning takes place in two passes of the strip through plating cells. First one side of the strip and then the other are coated. The complete process is carried out in a three-decked unit.

On the ground level the strip passes through twelve cells in one direction. Rising vertically at the end of the first pass to the second level, the flow of the strip is reversed and the upper side of the strip becomes the underside in the second passage through twelve more cells.

The strip again rises vertically at the end of the second pass and, resuming the original direction of flow, travels through a slightly alkaline bath and then through a water bath and scrubbing process before it descends to the ground level again.

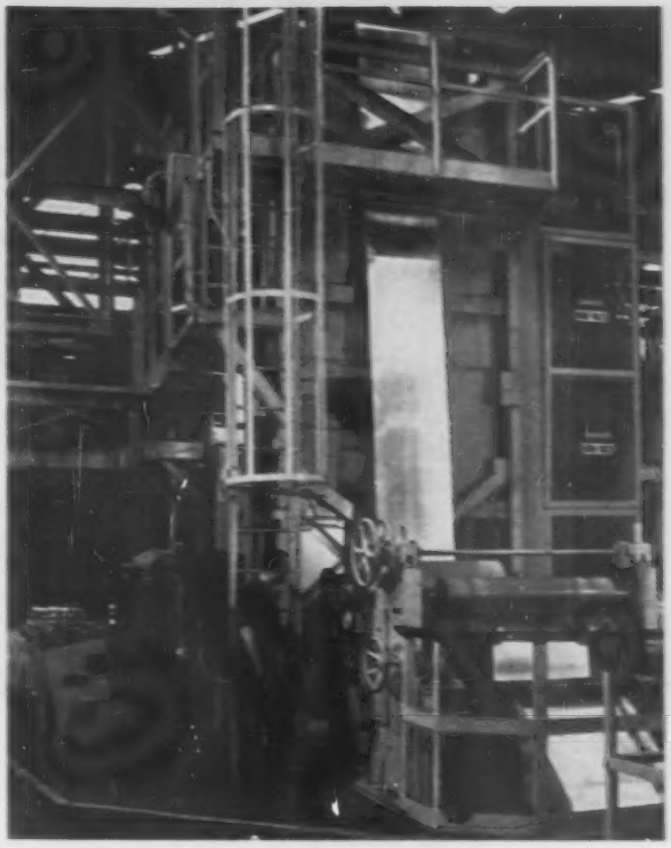
Here the strip passes through a chemical treatment and is then dried as it flows through a heating device. From the heater the line drops into a second "pay-off" pit. This provides slack to compensate for possible variations in the speed of the tinning process and the final bright flowing treatment.

The strip with its coat of matte tin ascends vertically 30 feet to the top of the high-frequency electric induction heater for this final treatment. Descending through the heater, the tin is heated till the tin flows, which imparts the bright, mirror-like finish familiar on the surfaces of tin containers.

From the heater, the strip continues its downward course, passing next through a quenching bath and then through driers where the moisture is removed by intense heat. From the drier the strip proceeds by one of two channels to one of two alternate coilers which receive the finished product. When a roll of strip on a coiler reaches about five feet in diameter, the line is cut and the roll is removed.

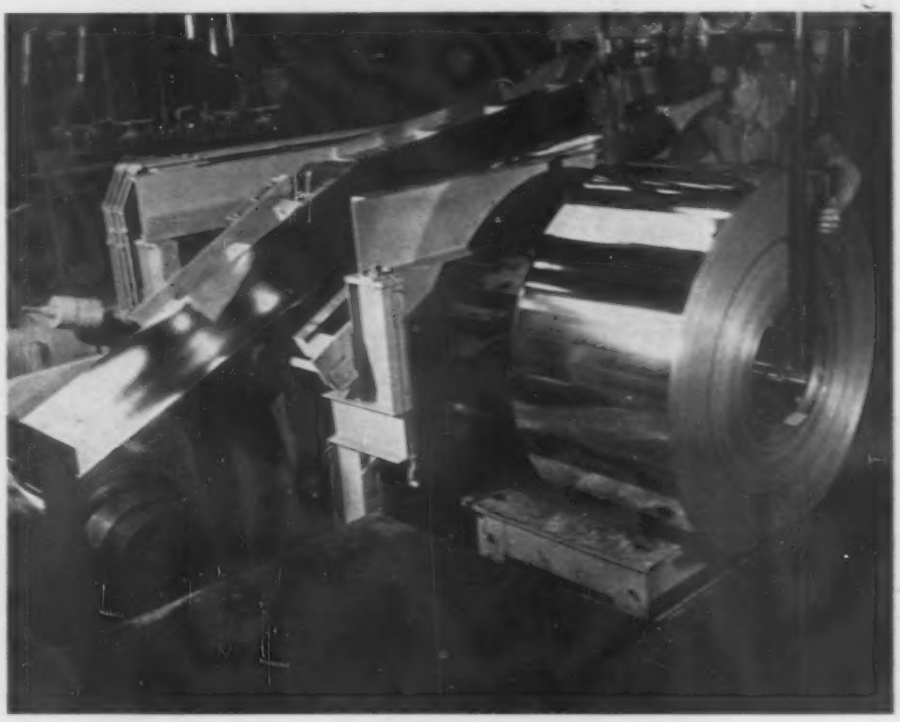
Already the thinner coatings applied by the new method are approved for many of the less critical uses. Cans made from electrolytic tin plate and enameled inside and out are used for such foods as peas, corn, beans, carrots, beets, meats and meat products.

It is anticipated that there will be an expanding post-war use of this type of tin plate in containers for coffee, biscuits, shortenings, dried milk, tobacco and oil. With electroplaters, steel men and chemists cooperating, it may well be that satisfactory containers made of electrolytic plate will be developed for even the more corrosive types of processed foods.



Right—Steel strip with tin coat in matte finish is shown rising to top of electrical induction heater through which it descends to take on bright, shining surface.

Below — Electrotinned steel strip in bright finish is shown being removed at end of the new continuous production line.



Metal Cleaning and Solvent Degreasing

By EDWARD ENGEL

Chief Engineer, Colonial Alloys Company, Philadelphia, Pa.

THIS article is not a scientific abstract, but rather presents a primary view to serve as a chart when considering the subject of metal cleaning and degreasing.

Solvent Degreasing

The purpose of solvent degreasing is to obtain suitable surfaces for subsequent operations such as (1) for interprocess handling (2) for painting (3) prior to alkaline cleaning or acid pickling (4) for inspection, repairs and maintenance. It assists subsequent cleaning treatments by serving to break down the interfacial tension between the metal, dirt and oil, thus resulting in more efficient cleaning operations. Proper degreasing presents a physically clean surface *but* not a chemically clean surface. In order to secure excellent results in electroplating, a chemically clean surface is required; solvent degreasing does not offer such a surface.

For purposes of classification there are three groups of solvent degreasers (1) no-flash-point solvents (2) safety solvents (3) red seal solvents.

The most used no-flash-point solvents in metal degreasing operations are the chlorinated hydrocarbon solvents, i.e. (1) carbon tetrachloride (stabilized and unstabilized) (2) trichlorethylene (stabilized) (3) perchlorethylene. Chlorinated solvents are stabilized to inhibit solvent breakdown, as otherwise readily occurs in the presence of heat, light, oxygen, moisture and certain substances such as aluminum dust.

The chlorinated solvents generally offer greater speed in degreasing, drying and less fire hazard than other types solvent degreasers. These solvents are the only type suitable for vapor phase degreasing. They are generally more adaptable for delicate instrument degreasing due to their high solvency power and high speed of drying.

The high cost of the chlorinated solvents legislates against their use in degreasing large parts and for removing very heavy greases. Further, their great toxicity and possible attack on metals, particularly aluminum and magnesium, require care and precaution in their use. In operation venting is required and manual handling should be avoided, and exposure to open flame is dangerous.

Another type of no-flash-point solvent is the *Water Emulsion* type. Like the stabilized chlorinated solvents it is offered under various trade names. The water emulsion solvents are kerosene, or safety solvents dispersed in water by means of a suitable emulsifying agent. This type of degreaser is extremely low in price and fairly efficient when used hot. It is very adaptable for use in spray washers. In particular this type of solvent is ideal for manual wiping and brushing operations due to its high safety factor and its very low toxicity as compared to other types of solvents and cleaners.

The Water Emulsion solvents may be used for open tank immersion degreasing when an overflow or grease dam is provided to carry off undissolved oils which rise to the surface; otherwise the surface oil will redeposit on the work being degreased upon withdrawal.

The second group of solvent degreasers are the *Safety* solvents. Any solvent degreaser having a flash point over 100°F. is considered as being a Safety solvent. These solvents are useful for general open tank immersion degreasing; especially where the volume of work does not warrant vapor phase degreasing. They should be maintained at about room temperature and venting is required for safety. They are not as toxic as the Chlorinated Solvents, though continuous manual operation tends to dry the hands and cause dermatitis. In general the safety solvents are not as efficient as to (1) power of solvency (2) speed of solvency (3) speed of drying; as the Chlorinated solvents.

A comparative newcomer to the group of Safety solvents is the *Emulsifiable* solvent type of degreaser. These are mixtures of suitable wetting and penetrant agents and kerosene or Safety solvents.

This type of degreaser does not have a great solvent action on oils and greases by itself but serves to make the oils and greases dispersible in water and further, the solution has excellent penetrating power. Therefore the procedure of degreasing when using Emulsifiable solvents is a two stage operation, i.e. (1) immersion or spraying of the solvent (2) followed by immersion or spraying with cold or hot water, or with a steam jet.

The particular advantages of this type of solvent is that it is (1) inexpensive in use for either small or large volume work—either small or large parts and, (2) has a better penetrating power on heavy greases and accumulations of greases and dirt than other types of degreasers (3) by reason of its low solvency power very little oil is left in the solvent, most of it being "dissolved" off in the subsequent water rinse, thus presenting a solvent with a long life.

This type of solvent is adaptable for use in vapor-degreasing machines, though the vapor phase cycle is dispensed with. It is operative in spray machines, in open tanks and for manual cleaning, i.e., if the wiping or brushing operations are conducted in the subsequent water bath. Work with deep recesses require care to insure proper drainage.

The solvent is used at room temperature, though the water rinse is generally operated at elevated temperatures.

The third group of solvent degreasers are the *Red Seal* solvents, i.e., solvents having a flash point of under 100°F. The use of these solvents is becoming less important due to their high fire hazards. When red seal solvents are stored or used the insurance rate is generally increased by about 30% over the premium charged when Safety solvents are operated. Some of this group of solvents are very toxic, such as benzene (benzol) and toluol; gasoline and kerosene and others marketed under trade names are also of this group.

Equipment and Procedures for Solvent Degreasing

Three general procedures are used in solvent degreasing operations: (1) open tank or immersion degreasing (2) spray washing (3) vapor phase degreasing, as 2 or 3 cycle vapor degreasing. The first named is the least expensive as to equipment. Spraying equipment may be relatively inexpensive or almost as costly as vapor degreasing, depending on selection of equipment.

The operation in the open tank depends solely on the dissolving action of the solvent, while the spraying operation has the added advantage of the mechanical lifting and penetrating action of the forced spray and in some instances the tumbling action of the work further accelerates grease removal.

Jet spraying is also particularly advantageous on very large work where open tanks or vapor phase cleaning would require abnormally large equipment. The use of a steam jet is of great value especially when the emulsifiable type degreaser has been operated as the first stage of the procedure. The steam jet removes heavy accumulations of grease and solid particle dirt in a much more efficient manner than obtainable by other means.

Vapor phase degreasing is in wide use due to its evident advantages in degreasing large volumes of small work. The action of the solvent in the vapor machine is two fold: (1) the solvent action of the hot solvent and (2) the solvent action of the condensed solvent vapors. Vapor phase operation may not be economical where very large work is to be degreased or where heavy greases or much solid particle dirt is present, though the machine can be operated with an Emulsifiable type solvent by cutting off the vapor phase cycle. Thus the machine can be adapted to removing heavy greases and dirt.

Alkaline Cleaners

A salt or salts which present an alkaline reaction when dissolved in water, or proprietary mixtures of such salts with wetting agents and inhibiting agents, are referred to as alkaline cleaning solutions.

Cleaning implies the removal of dirt and oxides, although strictly speaking alkaline solutions do not generally remove the oxides and scale and an additional treatment may be required, i.e., a pickling operation. However, in a number of applications an alkaline solution used as an immersion bath or as an electrolytic cleaner produces a chemically clean surface on metals. In many cases an alkaline solution is used without resort to prior treatment of the work in a solvent degreaser. In many other instances it has been found that two stage cleaning, i.e., the use of both a solvent degreaser and a subsequent alkaline cleaning operation results in greater efficiency.

Invariably alkaline solutions are used at elevated temperatures, whether operated as an immersion bath or as an electrolytic cleaner. The heat causes some of the mineral oils or mineral greases to be removed from metal surfaces. Mineral oils or greases are not saponified in alkaline solutions, i.e., they do not become water "soluble", and they float as a film on the surface of the solutions. This film may contaminate the metal when it is withdrawn from the bath. However, alkaline solutions do act to saponify animal and vegetable oils and greases. The action of (1) the heat (2) the scouring action of the heated solution together with (3) the lifting action on the dirt particles may serve to remove the mineral oils and greases from the metal surface, if the oil film is not too thick. But, as stated, contamination of the work may result, avoidance of which may require that the alkaline solution be discarded at very frequent intervals. This is costly both as to salts and to wasted heat.

In the use of alkaline solutions care must be exerted to avoid corrosive attack when cleaning non ferrous metals such as aluminum, zinc and brass and particularly is this true of the first named. If all traces of the alkaline salts are not removed the metal will be badly attacked.

Alkaline cleaning presents poor penetration as compared to solvent degreasing and therefore on deeply recessed work great care is required unless two stage cleaning is resorted to, i.e., unless a "precleaning" in a solvent degreaser is utilized.

To avoid over-exposure of non ferrous metals to alkaline solutions, which may cause attack on the metal, a "precleaning" in a solvent degreaser may shorten the time requirement in the alkaline solution. Discoloration occurs on non-ferrous metals under some conditions as the result of alkaline cleaning (or as the result of pickling) unless a "precleaning" in a solvent degreaser proceeds the alkaline immersion.

Types of Alkaline Cleaners

In general, the higher the Na_2O concentration and the higher the pH in an alkaline solution the greater the cleaning action and the greater the care that must be exerted to avoid corrosive attack on non-ferrous metals. In addition, the Na_2O and pH of the solution also indicate the degree of electrical conductivity. This is an important consideration when an alkaline solution is used as an electrolytic cleaner.

Alkaline solutions as rated in accordance with the Na_2O and pH factors are listed in the order of these factors, as follows:—

Caustic soda
Sodium Carbonate
50% caustic soda and 50% sodium sesquisilicate
Sodium sesquisilicate
Sodium metasilicate
Silicate of soda
Trisodium phosphate
Borax

Some of the alkaline solutions are listed below in the order of their emulsifying power on animal and vegetable oils and greases.

Sodium carbonate
Caustic soda
Trisodium phosphate
Sodium sesquicarbonate
Sodium silicate

(Concluded on page 85)

Production of Multi-Colored Effects on Anodized Aluminum

By V. F. HENLEY, B.Sc., A.I.C.

General Manager, Aluminum Protection Company Limited

THIS article is intended to provide a general description of those processes which have proved suitable for the production, on a commercial scale, of multi-colored finishes on anodized aluminum, and takes no account of methods which are still in the experimental stage. The reader is probably familiar with the general technique of anodic oxidation but it is interesting to note that of the many processes for producing oxide films only a few are of any great importance from the point of view of production of colored finishes and they may generally be classified under the following headings according to the main constituents of the electrolyte employed:

1. Chromic Acid Process — Bengough-Stuart.
2. Sulfuric Acid Process—"Alumilite" "Sheppard" and "Di-alumin" Processes.
3. Oxalic Acid Process — "Eloxal" Process.

As films formed in chromic acid are usually of an opaque grey color the dyeing of them is restricted to medium or deep colors; pale colors assume a rather dingy tone on account of the natural color of the anodic film. The "Eloxal" oxalic acid process is extensively used in Germany, whilst the sulfuric acid processes account for the majority of decorative anodizing in this country; in both cases the anodic films are almost transparent and lend themselves to dyeing in a range of colors varying from the palest pastel shades to black.

In view of the fact that the majority of the multi-colored anodizing in this country is carried out on sulfuric acid films the technique described in this article is intended to refer to sulfuric acid coatings so that slight modification might be necessary in some cases if the processes were to be applied to anodic films formed in oxalic or chromic acid.

(Reprinted with permission from The Metal Industry, London, June 18, 1943.)

The multi-color technique may be divided into two main headings, namely, those where the multi-colors obtained are fortuitous and cannot be guaranteed to conform to any given design, and those where the design is clearly defined and can be controlled within close limits.

Mottled Colors

The production of mottled colors on anodized aluminum calls for some method of either applying a number of colors in sequence to the uncolored film followed by a fixing process, or the coloring of the film in one particular color which is then chemically attacked in a non-uniform manner so as to remove one of the colors, leaving the film ready to take a different color if required.

Courtesy: Pictorial Education

Specimen of a map, the original of which was photographed in colors on aluminum.

A method for applying colors by means of a brush was recently described by G. O. Taylor[1] and presumably the application of the separate colors could be effected mechanically in dealing with large surfaces. In order effectively to seal colors applied by this method the use of a hot 2 per cent nickel acetate solution is indicated, as this has the effect of preventing the colors from dissolving out in contact with water and also increases the light-fastness. The older technique of sealing colored films with oils and waxes is not generally recommended as these compounds are often removed during exposure to weather and the color is then readily washed from the pores of the anodic film.

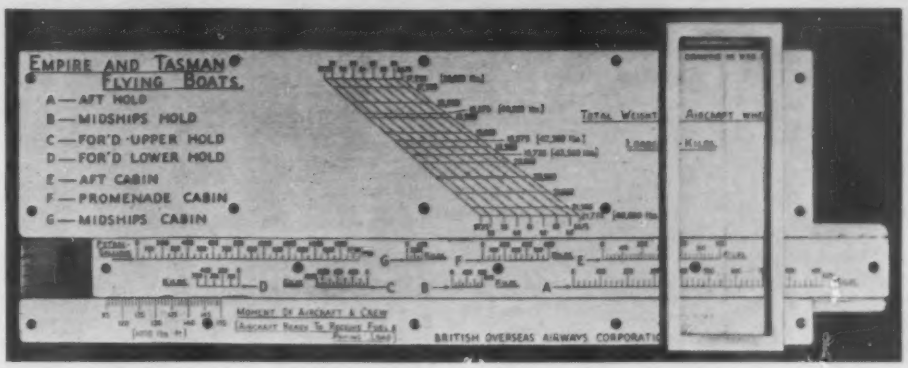
An ingenious method of producing multi-colors on aluminum was devised by C. H. R. Gower[2] and consists of immersing the anodic film in a strong solution of a metal salt, such as nickel acetate, at room temperature, and, without intermediate rinsing, immersing in a solution of ammonium sulfide. A skin of the corresponding insoluble metal sulfide, e.g., nickel sulfide, is formed over the whole of the surface of the anodic coating and if the coated sheet is then gently agitated the sulfide "envelope" ruptures at various points and at these points the metal sulfide is precipitated within the anodic film. As a result of this operation the aluminum film becomes mottled with an insoluble inorganic pigment which is quite resistant to water and in many cases is reasonably sun-fast. The precipitation of the sulfide can be followed after rinsing by immersion in an ordinary organic dye-stuff solution which will dye those portions of the film in which no sulfide has been precipitated. By using different metallic salts and sulfides, mottling in various colors can be produced on a single aluminum sheet and examples of aluminum articles colored by this process have aroused considerable interest at the various exhibitions where they have been shown.

It is obvious that although any given combination of colors can be guaranteed the exact pattern that they will assume is uncontrollable. This method is particularly useful for disguising faults in anodized aluminum articles arising from faulty casting, welds or imperfections in rolled sheet.

If an anodic film is dyed for a *short* time in one of the usual dye-stuffs it has been found that the color can be bleached out by the application of nitric or sulfuric acid, preferably the former, and if the acid is applied sporadically to the colored surface a two-colored effect is readily obtained. Owing to the mordanting effect of the nitric acid on the anodic film the decolorized portions have a considerable affinity for dye-stuffs and if a plate so treated is immersed in another dye bath a considerable amount of color is taken up by the previously decolorized portions and, of course, a certain amount by the portions which were already dyed in the original color. Details of the application of this process for the production of definite designs appear later in this article.

Double Anodizing

Before the technique of bleaching colors from the anodic film was developed the following process was evolved for the production of multicolored designs and it is still being used at the present time. In view of the somewhat complicated procedure the number of colors is usually limited to two. The first stage of the process consists of anodizing and dyeing the aluminum sheet in one of the chosen colors and this color is sealed so as to prevent the entry into the anodic film of the stopping-off compounds used in the later stages. After the color has been sealed and the plate dried off, the portions which have to remain in the original color are protected by the application of a litho compound which may be applied by an offset press. The printing ink is then dusted with asphalt powder and the plate is baked so as to soften the asphalt and to provide a continuous protective layer on all the portions which were originally inked.



Courtesy: British Overseas Airways Corporation

Aluminum slide-rule produced by the Alumilite "Alu-Photo" process involving impregnation of the anodic film with silver chloride.

The whole plate is then immersed either in a 5 per cent solution of hydrofluoric acid or in a cold 10 per cent solution of caustic soda. Both these solutions act as stripping agents and remove the unprotected portion of the colored anodic film. The plate is then fixed on to a suitable rack and is reanodized. The anodic treatment only takes place on the stripped portions of the coat as the asphalt is resistant to the action of the sulfuric acid electrolyte. When the anodizing process has been completed the plate is immersed in a dye bath containing the second chosen color. When the dyeing has been completed the color is sealed either by prolonging the time of dyeing using a boiling dye bath or by use of metal acetate solution followed by boiling in hot water. The plate is then swabbed with a solvent such as warm paraffin which dissolves the asphalt, revealing the underlying design in the original color. This process suffers from the disadvantage that the surface finish of the second color must, of necessity, be slightly less polished than the first owing to the etching action of the stripping agent, but there are many occasions when for purposes of contrast this shortcoming may be overlooked. Great care is required in applying the asphalt and the cost of the process is further increased by the necessity of carrying out two separate anodizing operations. In some cases this double anodizing process has been employed for the production of silver lettering on, for example, a black background, but this type of design can be produced much more expeditiously by one of the following processes.

Mottled plate in yellow, blue, light and dark green tints produced by the "Alumilite" broken-sulphide-film technique.

Stopping-off by Offset Printing

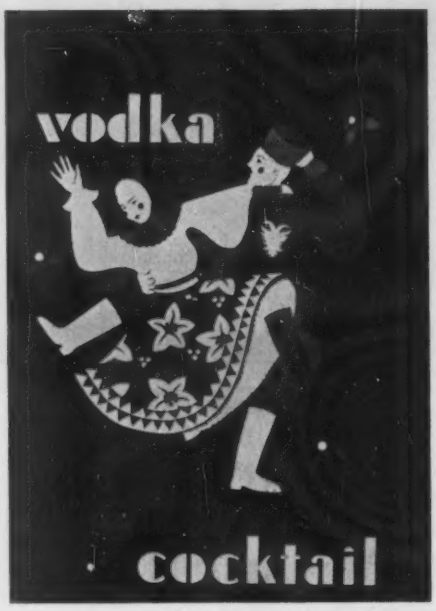
A modification of the asphalt stopping-off process mentioned above was beginning to attain importance just before the War for the production of designs in natural finish on a background which can be in any color. Advantage was taken of the fact that some of the off-set printing inks are sufficiently resistant to the action of dye solutions to act as stopping-off media.

The aluminum plates were anodized, carefully rinsed and dried off, care being taken to avoid water stains. The plates were then fed into an offset printing machine and the parts of the design that were to be in the original natural anodized finish were protected by the ink. This was allowed to dry for a short time after which the plates were immersed in a dye bath of the chosen color. When the dyeing and subsequent sealing operations had been completed the printing ink was removed by swabbing with a solvent, the result being a flush polished design which can very easily be kept clean.

For the production of silver lettering on black backgrounds this process is probably the most economical at present available and is particularly suitable for the rapid production of large quantities of plates. In cases where black letters on a natural background are required, difficulties sometimes arise from the lack of continuity of the applied printing ink over large areas. For designs of this type one of the photographic processes is preferred.

Stopping-off by Silk Screen Process

Some of the most outstanding examples of pre-war multi-color anodizing were carried out by a combination of the printing ink stopping-off process and the chemical bleaching method which was developed by British Anodising Limited. By this process an almost unlimited number of colors can be produced on anodized aluminum, although, from the point of view of cost and general practicability, the number is usually limited to four or five. The process involves the use of a set of silk screens for protecting the different colored areas as the process proceeds. The anodized aluminum plate is first dyed in the palest of the chosen colors, the time of dyeing being reduced to the minimum, after which the plate is dried off. All the areas which are to remain in the chosen pale color in the final design are then protected by a litho compound which is applied through a silk screen which has been cut out to the required design. After allowing the ink to dry, the plate is immersed in a dilute solution of nitric or sulfuric acid so that the unprotected portions are bleached. The plate is then rinsed and immersed in the second palest color of the series. The plate is dried off and any areas where the second color is required in the final design are stopped-off in the usual way. This process is repeated until the required number of colors has been applied, after which the stopping-off compound is dissolved off with a solvent and the plate is immersed in a cobalt acetate solution in order to increase the sun-fastness of the colors which, in view of the short time of dyeing, would tend to be fugitive. For larger scale production the stopping-off compound can be applied by offset printing using a series of blocks instead of silk screens. This process offers an obvious advantage in that only one



Specimen of an advertisement panel produced by the "Sheppard" stopping-off, bleaching and dyeing technique using a silk screen to apply the stopping-off medium. The original is in five colors, gold, red, green, and pink on a black background.

anodizing operation is required, all subsequent operations being carried out on the original anodic film. Designs involving large areas of one color require very careful treatment as it is essential that the stopping-off compound should be applied in a continuous layer. The silk screen process also provides a cheap and rapid method of dealing with small quantities of anodized plates where letters in natural finish are required on a background of any color.

Photographic Processes

All the processes so far described in this article are unsuitable for the production of designs to close dimensional tolerances owing to the fact that silk screens cannot be cut to, and do not maintain their shape, within close limits and the impressions obtained by the offset printing process are subject to dimensional changes due to the stretching of the rubber blanket.

Methods of producing photographic images in the anodic film have been described as far back as 1932 and are also the subject of a series of German patents which form the basis of the "Seo-foto" process. These processes were extensively employed in Germany using an oxalic acid film as a base for operations. Similar processes are in operation in this country and the procedure adopted is in accordance with the following general lines.

First, it is essential to build up a thick absorptive anodic film which is then saturated with a solution such as ammonium chloride, bromide, or iodide. The impregnated plate is then transferred to a solution of a silver salt, for example, nitrate, with the result that the corresponding insoluble silver halide is precipitated in the pores of the anodic film. Owing to the light-sensitivity of the silver halide the precipitation operation must be carried out under a "safe light." The excess of soluble salts is removed by rinsing, and the plate is then dried and is ready for exposure. For very accurate work glass negatives are employed and the sensitized aluminum plate is exposed to an arc light behind the negative for a period which depends upon the distance between the arc and the plate. When installing new equipment it is usual to conduct a short series of exposure tests to ascertain the optimum time of exposure.

After exposure the faint image which appears on the plate is intensified. Various formulae have been suggested for the developing solution and it is not possible to publish any details of the solutions now employed. The development time is, however, quite short and is followed by fixing in hypo solutions and subsequent toning, if necessary, with an appropriate metal salt depending upon the final color of image required. If the process has been carried out correctly the image obtained will withstand the action of a polishing mop dressed with ordinary lime finish and in some works this method of finishing the plate is employed, not only in order to improve the glossiness of the surface but also to detect faulty impregnation.

Where the dimensional tolerances are less exacting ordinary film negatives can be employed and, in addition, images can be obtained by projection. The photographic process can be used either for natural finishes on a black or toned background or for black or toned colors on a natural background.

As the anodic film is still receptive to dyes after the photographic process the undyed portion of the anodic film can be colored in the usual way thus giving, for example, black images on a yellow background or yellow images on a black background.

The above process is now being operated on a commercial scale in this country and in spite of the present restriction on the use of aluminum it has

found many useful applications, details of which, however, cannot be published at the present time.

General Considerations

Apart from the production of designs as described above it should be appreciated that further variety can be introduced by producing on the original aluminum sheet various types of surface either by mechanical processes such as scratch brushing, sandblasting or impressing, or by chemical methods such as etching and electrobrightening. The state of the art is such that when supplies of aluminum are once more released for ordinary civilian purposes multi-colored anodized aluminum will find a very big outlet in the advertising sign, advertising novelty and nameplate trade as well as for the production of decorative panelling and sheeting for architectural and other purposes.

During the war a number of new processes have been developed which cannot be described in detail at the moment, but which will eventually offer cheaper alternatives to some of the aforementioned processes and it is hoped that on some future occasion a further article will be published dealing with these developments.

Patents

The following is a list of the British Patents covering numerous features of the processes described above, and prospective users of any of the methods are strongly advised to communicate with the owners of these patents. It should be pointed out, however, that some of these patents have lapsed either due to age or non-renewal of fees.

223994 Bengough Stuart. Chromic Acid Process.

223995 Bengough Stuart. Dyeing of anodized aluminum.

226536 Anodizing in oxalic acid—"Eloxal" Process.

290901 Anodizing in sulfuric acid. "Alumilite" Process.

359494 Anodizing in sulfuric acid and glycerine. "Sheppard" Process.

378521 Describes impregnation of anodic films with light-sensitive or heat-sensitive salts.

406988 Sealing of anodic films in hot water.

407208 Use of air agitation to ensure uniform anodic coatings.

407456 Sealing of anodic films in hot water.

407830 Describes use of silver chloride, iodide, and bromide as sensitizing agents, as well as the use of the ferrogallate process. "Seo-foto" Process.

412193 Production of mottled coatings by the inorganic precipitation method.

413814 Sealing of colored anodic films with metal salts such as nickel acetate.

418498 Production of special anodic films for subsequent impregnation by successive electrolysis in chromic acid and then oxalic acid.

436154 Production of bright finishes on aluminum — "Alzak" Process.

439403 Use of colored waxes for stopping-off, followed by dyeing of the unwaxed portions of the anodic film.

442902 Production of special anodic films suitable for impregnation by anodizing at constant voltages in 20 per cent chromic acid.

445242 Stopping-off of anodic coatings by printing ink followed by dyeing and subsequent removal of the printing ink.

474609 Simultaneous dyeing and sealing of anodic films by prolonging use of boiling dye solution. "Di-alumin" Process.

476161 Production of thick anodic films in sulfuric acid—"Di-alumin" Process.

483776 Production of multi-color designs by stopping-off through silk screen and subsequent bleaching.

525734 Dyeing of anodic films with diazo dyes.

528314 Process for increasing the light fastness of colored anodic films by after-treatment with cobalt salts.

References

[1] G. O. Taylor. The Metal Industry, 1942, *61* 370.

[2] C. H. R. Gower. B. P. 413814.

Metal Cleaning and Solvent Degreasing

(*Concluded from page* 81)

Alkaline solutions require more delicate thermal control than the solvent degreaser in general to obtain the most efficient operation with the least attack on non-ferrous metals. A pH control is often necessary to maintain consistant results. Proprietary alkaline cleaners offer balanced salts for specific operations and include in general the important factors of good rinsability, penetration and wetting power.

Equipment and Procedures for Alkaline Cleaning

Three procedures are utilized in alkaline cleaning (1) open tank immersion (2) spray washing (3) electrocleaning. The first two factors follow the general comparisons given for the use of these procedures under solvent degreasing. The electrocleaning processes involve the use of electrolytic action in certain alkaline solutions, wherein the work to be cleaned is made either the cathode or the anode. The operation is generally more efficient than the non-electrolytic alkaline cleaning procedures.

In general, steel is cleaned in the electrolytic processes by making it the cathode or the anode, or both. Zinc, copper, magnesium, aluminum are generally made the cathode. Copper may be made the anode if solvent degreasing precedes the cleaning operation—otherwise discoloration of the work may occur if oil is present.

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Buffing and Polishing Wheels Discussed A large number of the members of the Baltimore-Washington Branch of the AES, including what Dr. Abner Brenner calls his "gang of girls from the Bureau of Standards", turned out to hear Mr. Gerald A. Lux deliver himself of an interesting talk on "Suggestions for Selection of Buffing and Polishing Wheels" illustrated with an exhibit of materials and wheels. He opened his talk by quoting Dr. Blum's definitions of buffing and polishing wheels. After pointing out the importance of selection factors such as the diameter of the wheel, the diameter of the arbor, and density, he then explained the manufacturers' material selection methods and the advantages and disadvantages of each kind of buffing wheel sewing. The density, or hardness, of a buffing wheel, he said, is determined by the number of stitches per inch, by the space between the rows of sewing, and by the number of sections of 20 plies each. The glue which is applied to the surface of buffing wheels, he warned, should not be heated in excess of 160°F., and the glue should be permitted to dry for 48 hours in a temperature of 70°F. if the best possible results are to be obtained from buffing wheels. After briefly discussing polishing wheels, and the speeds of both buffing and polishing wheels, Mr. Lux concluded his talk by emphasizing the need for a book on buffing and polishing which would give the correct speed, and the correct kind and size of buffing, or polishing wheel, for each kind of material.

Annual Dinner of Baltimore-Washington Branch The Baltimore-Washington Branch of the AES will hold its annual Educational Session and Banquet at the Lee Sheraton Hotel, Washington, D. C., on February 5, 1944. The educational session will begin at 4:00 P.M. Dr. C. L. Faust, of the Battelle Memorial Institute, Columbus, Ohio, will read a paper on "Electropolishing"; Mr. Ovide G. Hogaboom, of the New Britain Machine Company, New Britain, Connecticut, will present a paper on "Industrial Salvage by Electrodeposition"; and Mr. Frank K. Savage, General Superintendent of C. G. Conn, Ltd., will deliver himself on a subject of his own selection. Following the educational session, after the banquet, there will be a lively evening of dancing. In between the dances a floor show will be given by professional entertainers.

Electroplating and Anodizing Equipment Order Amended Electroplating and Anodizing Equipment Limitation Order L-110 issued on May 11, 1942 was amended on December 16, 1943. The general definitions in the original order were clarified in the amendment by specifically mentioning the various kinds of tanks and other equipment which come within the provisions of the amended order. Section 1226.10, Paragraphs (b) and (c), of the original order were amended to ease the restrictions on the acquisition of electroplating and anodizing equipment and spare and repair parts so that they may be obtained without a preference rating of A-1-j, or higher, assigned on Form PD-1A. The amended order provides that such equipment and parts up to an aggregate retail value of $500 may now be obtained under automatic ratings under CMP Regulation No. 5. If the equipment or parts cost more than $500 then the order must bear "a preference rating of AA-5 or higher assigned on Form WPB-541 (or PD-1A) or on Form WPB-617 (or PD-200)." Appeals from the provisions of the amended order must be made on Form WPB-1477, or by letter in triplicate.

A Bird's-eye View of 1944 War production is expected to reach its peak between now and June 1944. Civilian production will begin in a small way during the first half of 1944. Shortages of critical materials such as copper are expected to ease up between now and July 1st. There may be some price tightening during the next few months because of wage increases. Beginning with July it is expected there will be a slowing down of war production, with some materials being made available for civilian uses. But the availability of these materials will not be in sufficient quantities to push a "consumers' market".

Advertising Not an Allowable Expense Lindsay Warren, United States Comptroller General, as a sort of Christmas surprise, ruled in the case of Emerson Electric Manufacturing Company, and Fleetwings, Incorporated, that institutional advertising is not an allowable expense in cost-plus-fixed-fee contracts. But in spite of this ruling it appears that the Army, Navy, and Maritime Commission will ignore the Comptroller General. It seems a court decision is wanted on the ruling.

Aluminum Scrap Sales Restricted According to Directive No. 1 to Supplementary Order M-1-d, as amended, issued on December 20, 1943, the flow of certain high zinc alloy aluminum scrap was restricted. Beginning January 1, 1944, this kind of scrap may be sold only to the Aluminum Company of America and the National Smelting Company and their dealers.

Aluminum Scrap Re-defined Amendment No. 1 to Supplementary Order M-1-d was issued on December 20, 1943, for the purpose of removing from the definition of aluminum scrap residues containing less than 50 per cent recoverable aluminum. The amended order relaxes the requirement that persons generating or holding aluminum scrap deliver such material at 60 day intervals. Instead the scrap must be delivered at reasonable intervals.

Anti-Accident Campaign Begun by WPB A War Production Board anti-accident campaign will be carried out by the Industrial Health and Safety Section of the Labor Production Office, in cooperation with the technical staffs of other Federal agencies, during 1944. This Section states that 18,000 workers die from accidents each year. Classes are to be established on health and safety cooperation throughout the United States for the purpose of reducing accidents to a minimum.

Apprenticeship Courses Increase War Manpower Commission Chairman Paul V. McNutt announced on December 22, 1943, that 3,300 additional plants have adopted apprenticeship and short-term training programs during the twelve months ending November, 1943. This increase brings the total to 31,300 plants with such courses. "These short-term training programs," Mr. McNutt said, "have helped immeasurably to build up and maintain the ranks of semi-skilled men and women in our war production plants. Apprenticeship is as essential today as it has always been in peace time to develop the all-round skilled workers who are continually needed in every major industry."

"As We Win" The CIO has given a lot of thought to the subject of post-war conversion of industry for full employment. As a result the first of a series of reports was recently issued by the CIO Postwar Planning Committee. This interesting booklet called "As We Win" may be obtained from the Congress of Industrial Organizations, 718 Jackson Place, N.W. Washington 6, D. C., for five cents.

Brass and Bronze Uses Extended The WPB granted permission to use either brass or bronze in making nuts for packing gland flange bolts and studs in the manufacturing of iron gate valves and iron globe and angle valves. It also granted in Limitation Order L-252 as amended January 6, 1944, that brass or bronze may be used in the making of nuts for attaching the swing check disc to a hinge or arm of an iron check valve.

Charges for Overtime Repair Service Supplementary Service Regulation No. 21 to Maximum Price Regulation No. 165 issued on December 21, 1943, and effective December 27, 1943, provides that two methods may be used by service shops in the various repair trades in setting charges to customers to offset increased costs resulting from the payment of overtime wage rates. This action was taken by the OPA to aid suppliers of services whose prices are based on an hourly charge to customers and because of the trend in the repair business toward lengthening the work week and the payment of overtime wages beyond the first 40 hours. Under the first method the service shop may charge for work done in overtime hours at the same ratio as the overtime wages increase. In the second method the shop may adjust its charge to an amount which approximately represents the additional overtime cost.

Chromium Nickel Restrictions Lifted In revoking Limitation Order L-128 on January 8, 1944, restriction on the use of chromium and nickel were lifted in the manufacturing of automotive intake and exhaust valves for civilian uses on a pre-war basis. The pre-war intake valves for passenger cars and motor trucks averaged about 1.5 per cent chromium and 1.5 per cent nickel. The pre-war passenger exhaust valves contained 19 per cent chromium and 5 per cent of nickel. Pre-war exhaust valves for motor truck contained 19 per cent of chromium; and 10 per cent of nickel.

Cobalt Restrictions Removed Restrictions on the delivery and sale of cobalt were removed by General Preference M-39 as amended on December 30, 1943. But in spite of these restrictions vendors of more than 1000 pounds of cobalt in a month must report such sales on Form WPB-3454.

25,000 War Contracts To Be Renegotiated Under Secretary of War Robert P. Patterson announced on December 27, 1943, that about "25,000 war contractors will be subject to renegotiation proceedings with all Departments on 1942 war business." Some of these renegotiations are bound to affect some metal finishing establishments.

Contract Termination Article Issued The new uniform article for war contract termination, which will be part of the Bernard M. Baruch and John Hancock report was released by War Mobilization Director James F. Byrnes on January 8, 1944. In the letter of transmittal to Justice Byrnes the authors of this contract termination article said: "Difference between this Article and existing contracts will be outweighed by the advantages of the unified, simpler and speedier procedure for settling contracts which this Uniform Termination Article makes possible. Both the Termination Article and Cost Statement are confined to broad, workable principles, with details left to be covered in administrative regulations, manuals and instructions." Hundreds of contracting officers in Washington are studying the 1500 word war contract termination article and the "Statement of Principles for Determination of Costs upon Termination of Government Fixed Price Supply Contracts" approved by the Joint Contract Termination Board on December 31, 1943. As a result, in February official schools will be established throughout the United States for the conducting of contract termination classes for war contractors. WPB it is reported, will determine the schedule of contract cancellations.

Copper Recovery Inventory Branch Organized The Copper Recovery Inventory Branch of the WPB, located on the 43rd floor of the Empire State Building, 350 Fifth Avenue, New York City, has taken over the functions of the Copper Recovery Corporation which were located at 200 Madison Avenue, New York City. Mr. A. V. Nappy is chief of this new WPB branch. All manufacturers or other persons using copper and copper-base alloy material in primary form who have a surplus inventory are urgently requested to get in touch with the new branch in order that those who are in need may have their requirements met with despatch.

Directions 9 and 11 to CMP No. 5 Revoked The WPB has revoked Directions No. 9 and No. 11 to CMP Regulation No. 5 because the procedure under which employees are permitted to use their employers preference ratings for hand tools and safety equipment such as rubber gloves, and respirators is now included in Direction No. 4 to Priorities Regulation No. 3.

Electric Fuses Now Made of Copper The WPB, on December 17, 1943, restrictions were removed on the use of copper and copper base alloy for renewable electric fuses and electrical wiring devices. Control over the distribution of these products, however, remains unchanged, except that a rating of AA-5 or higher is required instead of a rating of A-1-j. Non-renewable fuses continue to be subject to the restrictions on the use of copper and copper base alloy.

The End of a Bad Cent The United States Mint has discontinued the making of new steel pennies which were sometimes passed or accepted as dimes. When the 700,000,000 pesky things are completely out of circulation many persons will be happy. It is said that hoarders have been collecting this steel issue in the hope that they may become a future rarity.

Excess-Profits Tax Bonds to Be Issued In the near future the United States Treasury will issue Excess-Profits Tax Refund Bonds to metal finishing corporations and other companies on their 1942 excess profits taxes because companies are entitled to 10 per cent post-war refunds. Similar refund bonds will be issued for excess profits for 1943 and 1944. These bonds will not bear interest and they cannot be sold or exchanged until after the war. And they will be issued only to companies upon certification of the Commissioner of Internal Revenue. After the war, when the bonds are cashed the proceeds are not to be reported as part of gross income for the year in which they are cashed because they are exempt from federal, state and local taxes; but, such monies are subject to estate, inheritance, gift and excise taxes.

2,000,000 Flatirons for 1944 As 1943 was about to close, the WPB approved the production of 2,000,000 flatirons in 1944 for civilian use. While this is only 40 per cent of the normal annual production of flatirons yet it will add a little extra electroplating activity for civilian production. In a recent survey it was stated that only one electric flatiron was found in all the retail stores of the country, and that was being kept for museum display purposes. These flatirons, it is reported, are not expected to reach the shelves of retailers until about July first.

Glass Container Production in 1944 The 1944 quotas of new glass containers and metal caps will be about the same as in 1943. In other words about 92,000,000 gross of glass containers will be made in 1944. Limitation Order L-103-b as amended January 5, 1944, provides for the use of glass containers for many chemical products.

Gold for Jewelry Eased According to General Limitation Order L-45 as amended January 15 1944, the manufacturers of jewelry may use in 1944, in weight, 75 per cent as much karat gold (10 karat or finer) and palladium as they used in 1941. However, manufacturers who used karat gold or palladium in 1941 and who now use a combined total of less than 250 ounces per calendar quarter are not affected by the restriction of this order.

Iridium Order Amended Three changes appear in Iridium Conservation Order M-49 as amended on December 18, 1943. The first change exempts persons using five ounces or less of iridium per month from the necessity of securing allocation authorization. The second change provides that persons who have less than ten ounces of iridium in inventory and who use less than five ounces in one month are no longer required to make reports. And third, the use of iridium was extended.

Individual Preference Ratings of Chemical Manufacturers Individual preference ratings and allotment symbols have been assigned to chemical manufacturers since January 14, 1944, under Preference Rating Order P-89 on applications for their purchase orders for maintenance, repair and operating supplies instead of blanket rating of AA-1 and the allotment symbol MRO-P-89. This amendment to Order P-89 does not change the restrictions which confine the use of MRO ratings and symbols to purchases of fabricated parts and equipment having a value of less than $500 and of aluminum in controlled material forms to amounts not to exceed 500 pounds in any one calendar quarter.

An Interpretation of Order L-219 To clarify the meaning of certain provisions of Inventory Control Order L-219 the WPB issued Interpretation No. 5 of this Order. This interpretation states that Interpretation No. 8 of Priorities Regulation No. 1, which deals with units of the same enterprise, does not apply to Order L-219. It also declares that a merchant is not required to refuse delivery of goods because acceptance would cause his inventory to exceed the specified limit at the beginning of a quarterly inventory period.

Laboratory Instrument Blanket MRO Ratings The WPB's Safety and Technical Equipment Division issued a statement on December 31, 1943, which states that "a blanket MRO rating, as defined in Priorities Regulation 3, is a rating assigned for maintenance, repair or operating supplies without specifying the kind and quantity of the material to which the rating may be applied. Such ratings are assigned by CMP Regulations 5 or 5A and by certain other WPB regulations, certificates, or orders, including orders in the 'P' series." Priorities Regulation 3, as amended December 18, 1943, makes clear "that restrictions on the use of the blanket MRO ratings for laboratory instruments and equipment apply to parts for such items (whether or not such parts are for repair or maintenance as well as to the finished items themselves. The only blanket MRO ratings which may be used for laboratory instruments or equipment, or parts thereof, are ratings assigned under the following orders: P-43 (laboratories), P-68 (Iron and Steel), P-89 (Chemicals), P-98-b (Petroleum), P-56 (Mines), P-58 (South American Copper Production), and P-73 (Non-ferrous Smelters and Refiners)." All those who do not operate under a "P" order must apply for ratings for laboratory instruments, equipment and parts on Form WPB-541.

Latest Reports on Quarterly Basis General Preference Order M-38 as amended December 24, 1943, provides that beginning January 1, 1944, dealers in pig lead and manufacturers of lead-bearing products who either sell or consume 40 tons or more of lead during the last calendar quarter of 1943 or who "had in his possession or under his control twenty tons of lead on the last day of the preceding calendar quarter" must now file quarterly reports instead of monthly reports on Form WPB-95. *Order M-38 restricts the use of lead for such commodities as buttons, badges, emblems, costume jewelry, novelties and trophies, games and toys, and for any decorative purposes.*

Molybdenum Restrictions Lifted General Preference Order M-110, as amended December 30, 1943, has removed restrictions on the delivery and sale of molybdenum. Venders of more than 2,000 pounds of molybdenum a month must make monthly reports on Form WPB 3453 in spite of the lifting of restrictions.

Nickel and Nickel Alloys Film Available Any reader of *Metal Finishing* may obtain the loan of a 32 minute, 16 millimeter sound film on "Nickel and Nickel Alloys" by making application to the Graphic Service Section, Bureau of Mines, Department of Interior, 4800 Forbes Street, Pittsburgh 13, Pennsylvania. This film is the story of nickel from crude matte to finished products. Branches of the American Electroplaters' Society could use this film as part of their educational session at any of their regular meetings. Although no charge is made for the use of the film, the borrower is expected to pay transportation charges.

Old-Age and Survivors Insurance for Small Business Senator James E. Murray, chairman of the Senate Special Committee on Small Business recently consulted with Arthur J. Altmeyer, chairman of the Social Security Board of the Federal Security Agency, for the purpose of formulating plans to extend old-age and survivors insurance protection to the smaller businessmen of the United States. In this contemplated move the first step will be the making of a survey by the staff of the Social Board. Since most electroplating shops come within the category of small business they will be expected to answer questions like these: (a) How can electroplaters and other small businessmen furnish reports of business income for coverage purposes without adding to the complexity of the records they are already required to keep for various Government agencies? (b) What equitable provisions are necessary in the case of the small electroplater who upon retirement has not entirely relinquished control over the business they built up? (c) To what extent do electroplaters now contribute to the program as employers of covered workers or by reason of their own employment as wage earners; and how frequently do their wage records make them potentially eligible for benefits?

WPB Decentralizes Metal Finishing Unit A number of changes in the metal finishing units of WPB will take place within the next month because of the decentralization of the Board. It is the intention of the Board that local offices should deal directly with metal finishers. As a result only a policy making personnel will be maintained in Washington.

Rhodium Sesquioxide, Hydrated: See Salt, Table: See Sodium Chloride. **Silicofluoric Acid:** See Hydrofluosilicic

Dictionary of Metal Finishing Chemicals

Petrolatum, Liquid: Sp. gr. 0.84-0.94. B. P. between 330° and 390°C. Colorless, transparent, oily liquid. Also known as Alboline, Liquid Paraffin, Mineral Glycerol, Mineral Oil, White Mineral Oil, Paraffin Oil. Insoluble in water and in cold alcohol. Soluble in boiling alcohol, benzene, ether, chloroform, carbon disulfide, various hydrocarbon oils. Grades: Technical, U. S. P. (white, amber). Containers: Bottles, Tins (1, 5 lb.); Jugs (1 gal.); Wood barrels (50 gal.); Drums (55 gal.).

Petrolatum, White: Decolorized Petrolatum, q.v.

Petroleum: Sp. gr. 0.78-0.97. Yellow to dark red or black, thick, oily, liquid mixture of various hydrocarbons. Also known as Naphtha, Crude Oil, Earth Oil. Grades: Technical. Containers: Barrels, Tanks.

Petroleum Asphalt: See Asphalt.

Petroleum Ether: A mixture of the lighter and lower boiling hydrocarbon constituents of petroleum, q. v. Sp. gr. 0.62-0.675. B. P. 20°-110°C. Also known as Benzine, Petroleum Naphtha. Insoluble in water. Soluble in alcohol, ether, benzene, chloroform, various oils. Grades: Technical, Purified, C. P. (Boiling range 20°-40°, 25°-65°C., 30°-60°C., 35°-60°, 30°-89°C., 65°-110°C.). Containers: Bottles (1, 5 lb.); Cans (1, 5, 10, 25 gal.); Drums (25 lb.; 55 gal.).

Petroleum Jelly: See Petrolatum.

Petroleum Naphtha: See Petroleum Ether.

Phenol: C_6H_5OH. Mol. wt. 94.108. Sp. gr. 1.072. M. P. 41°C. B. P. 182°C. Colorless to white rhombic needles or crystalline mass. Hygroscopic and pink colored when impure. Also known as Carbolic Acid, Hydroxybenzene, Phenylic Acid, Hydroxybenzol, Phenyl Hydrate. Solubility, 6.5 at 15°C. Infinitely soluble in hot water, alcohol. Very soluble in ether. Soluble in glycerin, carbon disulfide, chloroform. Grades: Fused crystal, Loose crystal; Technical; Crude (25-30%; 50%); U. S. P.; C. P.; U. S. P. (liquid 88%). Containers: Bottles (1, 5 lb.); Cans (1, 5, 10, 25, 50, 100, 200 lb.). Drums (55 gal; 200, 875 lb.); Tanks; Carboys—88% liquid (100 lb.).

This is the fourteenth consecutive installment of the alphabetical listing of chemicals used in electroplating.

Phenolsulfonic Acid: $HOC_6H_4SO_3H$. Mol. wt. 174.17. Sp. gr. 1.56. A mixture of ortho and paraphenolsulfonic acids. Colorless or slightly yellow-brown liquid. Also known as Sulfocarbolic Acid. Soluble in water, alcohol, glycerin. Grades: Technical, Purified. Containers: Bottles (1, 5 lb.); Iron Drums.

Phenol Trinitrate: See Picric Acid.

Phenylformic Acid: See Benzoic Acid.

Phenyl Hydrate: See Phenol.

Phenyl Hydride: See Benzene.

Phenylic Acid: See Phenol.

Pyrogallol: See Pyrogallic Acid.

Pyrolusite: A natural form of Manganese Dioxide, q.v.

Pyrosulfuric Acid: See Sulfuric Acid, Fuming.

Quicklime: See Calcium Oxide.

Quicksilver: See Mercury.

Quinhydrone: $C_6H_4O_2C_6H_4(OH)_2$. Mol. wt. 218.20. Sp. gr. 1.401. M. P. 171°C. Dark green rhombic prisms. Sublimes when heated to higher temperatures. Slightly soluble in water. Very soluble in alcohol and in ether. Soluble in ammonium hydroxide. Grades: Technical, C. P. Containers: Bottles (1 oz., ¼, 1 lb.).

Red Earth: See Ferric Oxide, Red.

Red Lead: See Lead Oxide, Red.

Red Mercury Iodide: See Mercuric Iodide.

Red Mercury Oxide: See Mercuric Oxide.

Red Oil: See Oleic Acid.

Red Oxide: See Ferric Oxide, Red.

Red Prussiate of Potash: See Potassium Ferricyanide.

Red Prussiate of Soda: See Sodium Ferricyanide.

Reddle: See Ferric Oxide, Red.

Resin: Oxidation or polymerization product of terpenes together with acids and esters. Obtained from the secretions of certain trees. Light colored, hard solids having conchoidal fracture and amorphous structure.

Retort Carbon: See Carbon, Gas.

Retort Graphite: See Carbon, Gas.

Rhenium: Re. At. wt. 186.31. Sp. gr. 20.5. M. P. 3440°C. Hexagonal, lustrous metal. Insoluble in water. Soluble in hydrogen peroxide and in concentrated nitric acid. Grades: Technical, C. P. Containers: Bottles (1, 10 g.).

Rhodium: Rh. At. wt. 102.91. Sp. gr. 12.44. M. P. 1985°C. Cubic, gray white, ductile, malleable metal—quite hard. Insoluble in water. Slightly soluble in acids, aqua regia when finely divided. Grades: Technical. Containers: Ingots, powder. Bottles (½, 1 g.).

Rhodium Ammonium Nitrite: $RhNa(NH_4)_2(NO_2)_6$. Mol. wt. 438.04. Fine, white crystals. Insoluble in cold water. Slightly soluble in hot water. Decomposes in acids. Grades: Technical. Containers: Bottles (½, 1 oz.).

Rhodium Chloride: $RhCl_3 \cdot 3H_2O$. Mol. wt. 263.33. Reddish brown or black glassy deliquescent powder. Decomposes when heated to above 450°C. Very soluble in water and in hydrochloric acid. Grades: Technical, Purified. Containers: Bottles (1 g., ½, 1 oz.).

Rhodium Chloropentaminochloride: $[Rh(NH_3)_5Cl]Cl_2$. Mol. wt. 294.44. Yellowish, white crystals. Slightly soluble in cold water. Soluble in hot water. Grades: Technical. Containers: Bottles (½, 1 oz.).

Rhodium Diamminonitrite: $Rh(NH_3)_2NO_2$. Mol. wt. 182.98.

Rhodium Hydroxide: $Rh_2O_3 \cdot 5H_2O$. Mol. wt. 343.90. Yellow gelatinous solid. Also known as Rhodium Sesquioxide, Hydrated. Decomposes when heated. Insoluble in water. Soluble in acids. Grades: Technical. Containers: Bottles (½, 1 oz.).

Rhodium Nitrate: $Rh(NO_3)_3 \cdot 2H_2O$. Mol. wt. 324.96. Red amorphous, hydroscopic powder. Very soluble in water. Insoluble in alcohol. Grades: Technical. Containers: Bottles (½, 1 oz.).

Abbreviations: Mol. wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Rhodium Sesquioxide, Hydrated: See Rhodium Hydroxide.

Rhodium Sulfate: $Rh_2(SO_4)_3$. Mol. wt. 494.00. Red brown powder. Slightly soluble in cold water. Decomposes in hot water. Grades: Technical. Containers: Bottles (½, 1 oz.).

Rochelle Salt: See Potassium Sodium Tartrate.

Rosin: See Colophony.

Rosin Oil: White to brown liquid distilled from rosin above 360°C. water. Sp. gr. 0.98-1.11. Insoluble in water. Soluble in ether, chloroform, fatty oils and carbon disulfide. Slightly soluble in alcohol. Grades: Technical. Containers: Cans (1, 5 lb.); Tins (1, 5 gal.); Barrels (50 gal.); Drums (55 gal.).

Rosin Soap: See Soap.

Rottenstone: See Tripoli.

Rouge: See Ferric Oxide, Red.

Rouge, Black: See Ferric Oxide, Black.

Saccharose: See Sucrose.

Sal Ammoniac: See Ammonium Chloride.

Sal Chalybis: See Ferrous Sulfate.

Sal Soda: See Sodium Carbonate, Decahydrate.

Sal Tartar: See Sodium Tartrate.

Salt, Bay: See Bay Salt and Sodium Chloride.

Salt Cake: An impure form of Sodium Sulfate, about 93-95% Na_2SO_4. Grades: Technical, Glassmakers' (iron free). Containers: Bags (200 lb.); Barrels (375, 500 lb.); Bulk.

Salt, Common: See Sodium Chloride.

Salt, Epsom: See Magnesium Sulfate.

Salt, Glauber's: See Sodium Sulfate, Hydrated.

Salt of Sorrel: See Potassium Binoxalate.

Saltpeter: See Potassium Nitrate.

Saltpeter, Chile: See Sodium Nitrate.

Saltpeter, Soda: See Sodium Nitrate.

Saltpetre: See Potassium Nitrate.

Salt, Rock: A natural form of Sodium Chloride, q.v.

Salt, Sea: See Sodium Chloride.

Salt, Table: See Sodium Chloride.

Salt, Tin: See Stannous Chloride.

Sand Acid: See Hydrofluosilicic Acid.

Saponin: $C_{32}H_{52}O_{17}$. Mol. wt. 708.736. White, amorphous glucoside with unpleasant taste and odor. Foams when shaken with water. Soluble in water. Grades: Technical, Purified. Containers: Bottles (1, 5 lb.); Cans (1, 5, 10, 25 lb.); Boxes (25, 50 lb.); Kegs (100 lb.).

Sea Salt: See Sodium Chloride.

Seignette Salt: See Potassium Sodium Tartrate.

Selenious Acid: See Selenous Acid.

Selenium: Se_8. Mol. wt. 631.68. Sp. gr. 4.3-4.8. M. P. 217°C. B. P. 688°C. Trigonal, gray metal, vitrous red to black solid or amorphous red powder sticks, lumps, crystal. Insoluble in water. Soluble in sulfuric acid and in nitric acid. Powder and crystal forms are soluble in carbon disulfide. Grades: Technical. Containers: Bottles (1 oz., ¼, 1 lb.); Boxes (1, 5 lb.); Cases (100 lb.).

Selenous Acid: H_2SeO_3. Mol. wt. 128.98. Sp. gr. 3.004. Also known as Selenious Acid. Hexagonal colorless crystals. Decomposes when heated. Solubility, 167 at 20°C. Very soluble in hot water and in alcohol. Grades: Technical, C. P. Containers: Bottles (1 oz., ¼, 1 lb.).

Shellac: A resin produced by the bite or sting of certain insects on bark of trees. Also known as Button Lac. Grades: D. C., V. S. O., Diamond 1, Superfine Orange, Fine Orange, Medium Orange, T. N., A. C. Garnet, Button, Bleached. Containers: Cartons (1, 10, 25 lb.); Kegs (100, 125 lb.); Bags (164 lb.); Cases (190 lb.); Barrels (250, 300 lb.).

Sienna, Burnt: Orange brown pigment made by calcining Raw Sienna, q.v.

Sienna, Raw: A yellowish brown ocher containing manganese and iron. See Ocher.

Silex: See Silica.

Silica: White or colorless crystalline silicon dioxide. Very hard. Also known as Silex. Found naturally as Quartz.

Silica Gel: A partially dehydrated silicic acid (H_4SiO_4) containing 3-7% water. Hard granules or powder, transparent and glassy in appearance. Insoluble in most reagents. Soluble in hydrofluoric acid. Grades: Technical. Containers: Drums, Barrels.

Silicofluoric Acid: See Hydrofluosilicic Acid.

Silicon: Si. At. wt. 28.06. Sp. gr. 2.0-2.4. M. P. 1420°C. (cryst.). Cubic, steel gray crystals, fused lumps or gray amorphous powder. Insoluble in water. Soluble in hydrofluoric and nitric acids. Soluble in alkalies. Grades: Technical, C. P. Containers: Bottles (⅛, ¼, 1 oz., 1, 5 lb.); Cartons (1, 5 lb.); Kegs.

Silicon Carbide: SiC. Mol. wt. 40.07. Sp. gr. 3.17. M. P. above 2700°C. Hexagonal, colorless crystals when pure. Usually greenish or bluish black powder or iridescent, porous crystalline mass. Insoluble in water and in acids. Decomposes in fused alkalies. Grades: Technical. Containers: Cans (1, 5, 10 lb.); Kegs (100 lb.); Drums.

Silver: Ag. At. wt. 107.880. Sp. gr. 10.49. M. P. 960.5°C. Cubic white metal, malleable and ductile. Insoluble in water. Soluble in nitric acid and in hot concentrated sulfuric acid. Slowly soluble in cyanide solutions. Insoluble in alkalies. Grades: Pure, Sterling, Coin, C. P. Containers: Bottles (1 oz., ¼ lb., 10 oz., 1 lb.).

Silver Bromide: AgBr. Mol. wt. 187.796. Sp. gr. 6.473. M. P. 434°C. Cubic pale yellow crystals or yellow powder. Darkens on exposure to light. Decomposes at 700°C. Insoluble in water. Soluble in solutions of cyanides or thiosulfates. Slightly soluble in ammonium hydroxide. Soluble in hot nitric and in hot sulfuric acid. Grades: Technical, C. P. Containers: Bottles (1 oz., 1 lb.).

Silver Carbonate: Ag_2CO_3. Mol. wt. 275.770. Sp. gr. 6.077. Yellow powder. Decomposes when heated. Very slightly soluble in water. Soluble in ammonia, sodium thiosulfate, cyanide. Grades: Technical, C. P. Containers: Bottles (1, 16, 100 oz.).

Silver Chloride: AgCl. Mol. wt. 143.337. Sp. gr. 5.561. M. P. 455°C. Cubic white crystals or granular white powder. Darkens on exposure to light. Insoluble in water. Soluble in ammonium hydroxide, in cyanide solutions and in thiosulfate solutions. Soluble in hot nitric acid and in hot sulfuric acid. Grades: Technical, C. P. Containers: Bottles (1, 4, 16, 50, 80, 100 oz.); Cans (50 oz.).

Silver Chromate: Ag_2CrO_4. Mol. wt. 331.77. Sp. gr. 5.63 Monoclinic red crystals or powder. Insoluble in water. Soluble in acids, ammonium hydroxide and in cyanide solutions. Grades: Technical, C. P. Containers: Bottles (1 oz., 1 lb.).

Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

and upwardly around the outer surface of

spray metal bonding by contacting multi-

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Chemical or Heat Treated?

Question: We are enclosing herewith a sample and would like you to advise the type of finish on this piece. Has it been treated with a chemical or heat treated? If it has a chemical finish can you advise us as to where we may purchase the materials for this type of finish.

We have a large order for this type of work on steel and would appreciate your advice as soon as possible regarding this.

Q. P. W.

Answer: The finish is definitely not a heat color since such colors, generally known as temper colors, are soluble in hydrochloric acid. It may be an immersion bronze which is obtained from a solution containing from one to two ounces each of copper sulfate and tin chloride.

There was not a sufficient amount of the finish for us to determine conclusively what it is. If you can furnish more samples, we will analyze for copper in an attempt to see whether or not it is a brass coating.

Chrome on Tools

Question: Possibly you can advise me why hard chrome will flake on tools when .010" or .020" is applied to same.

M. M.

Answer: A chromium thickness of 0.010-0.020" is generally much too heavy for tools and it is suggested that 0.0001" be applied instead. Flaking may also be due to poor surface preparation.

Guidebook Omission

Question: On page 98 of the 1943 Plating and Finishing Guidebook it seems to me that there is something missing in the analysis of the cyanide zinc solution.

Should not something be done to the sample after adding the hydrochloric acid, and before titrating with the ferrocyanide solution? I would appreciate a little more data on this; and am enclosing a stamped addressed envelope for your reply.

G. A. P.

Answer: We would advise that step No. 3 was inadvertently omitted. This is the same as step No. 3 above in the analysis of the acid zinc solutions, namely: Add 115 c.c. of distilled water and 25 c.c. of 20% ammonium chloride solution. Heat almost to boiling.

Copper on Stainless Steel

Question: We are very much interested in the application of copper to stainless steel metal and would appreciate information regarding processes being used commercially. It would be necessary to apply a minimum deposit of .030" thickness of copper over a given area of stainless steel. A part of the surface would not be plated.

Products have been manufactured requiring treatments similar to that which might be suitable for our production but we do not know whether the process was of mechanical or electrochemical nature. Sources of information to which you might refer us would be valuable.

N. S.

Answer: Two methods for preparing the surface for adherent deposits are in commercial use. The preferable one is the Wood solution (*Metal Industry*, Vol. 36, p. 330, 1938) which consists of a one to two minute treatment with direct current at six volts in a solution containing two pounds per gallon nickel chloride and one pint per gallon hydrochloric acid.

The other process which gives satisfactory results is the one of Gardam (*Journal*, Electrodepositors' Technical Society, March, 1937). The part is treated as cathode at 35 degrees C. and 150 amperes per square foot in a solution consisting of 240 grams per liter of single nickel salts and 50 grams per liter sulfuric acid.

Both of these treatments produce an adherent but very thin deposit of nickel on the stainless steel and the articles can then be transferred to the copper plating solution for building up the desired thickness.

Treatment of Cadmium Plated Steel

Question: We would appreciate information on the treatment of cadmium plated steel to eliminate hydrogen embrittlement. It is our impression that this can be accomplished by a half-hour bath in water at 190°.

G. M.

Answer: We would advise that heat treatment for a half hour in a water bath at 190 degrees F. is not suitable. It is necessary to heat it to a temperature no lower than 300 degrees F., and preferably to 400 degrees F., for a few hours to remove this condition.

Blueing Formula for Steel

Question: Could you at this time forward me a reliable blueing formula for steel?

F. S. J.

Answer: A blue formula which was published in the Bureau of Standards Circular No. 80 is as follows:

Iron chloride	400 parts
Antimony trichloride	400 "
Gallic acid	200 "
Water	1000 "

This mixture is applied with a sponge and allowed to dry for a few hours. The loose dust is brushed off with a wire brush and the treatment is repeated as often as required to obtain the desired blue after which the steel is oiled.

You will find a number of interesting formulas for blueing steel in National Bureau of Standards Circular No. 80, Second Edition, 1922, and in Letter Circular LC 630, February 1, 1941. These may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Rapid Identification

Question: We understand that possibly a year or two ago, you published an article on the rapid identification of various metals and alloys by chemical or other means. Would you advise us of the issue in which this appeared?

If you have other information on this subject, we would appreciate receiving it also.

R.C.A.

Answer: A very interesting procedure on the systematic identification of electrodeposits will be found in an article by H. Neckamkin and A. Sanders, "Industrial and Engineering Chemistry", Analytical Edition, Vol. 14, p. 913 (1942).

The International Nickel Company, we believe, has a bulletin which includes the identification of various alloys by chemical and spot tests. We would suggest that you communicate with them for further details.

Thickness Specifications

Question: We have recently received a reprint of your comments on Salt Spray Specifications from the November, 1942, issue.

In the manufacture of relays we are constantly faced with the problem of specifying protective coatings, and we would appreciate what you might give us on the substitution of thickness specifications for the salt spray specifications.

C. E. C.

Answer: Thickness requirements for electrodeposits will vary with the type of deposit and it is suggested that you examine the specifications of the A.S.T.M. for coatings such as copper, nickel, chromium, zinc, cadmium, lead and tin on various metals.

Patents

Hot Dipping Machine

U. S. Pat. 2,332,978. F. J. Ahern, Oct. 26, 1943. An apparatus of the character described having in combination a furnace chamber having a bath of molten metal for coating purposes, an inlet passageway for metal to be coated entering such furnace chamber at a downwardly inclined angle with the inner end portion of such passageway immersed beneath the surface of such coating metal bath, an outlet passageway for the metal to be coated positioned at an upwardly inclined angle and having one end immersed beneath the coating bath, and having an intermediate arcuate portion with a downwardly inclined outer end immersed in a liquid sealing bath, and means including a jet manifold communicating with the arcuate portion of said outlet passageway to supply a non-oxidizing gas thereto at a point above atmospheric pressure to force excess coating metal back into the bath.

Composition Applicator

U. S. Pat. 2,332,992. J. V. Davis, assignor to The Udylite Corp., Oct. 26, 1943. An applicator for dispensing pasty or semi-liquid material comprising in combination a housing having a chamber therein, a flexible diaphragm for said chamber, a source of the material to be dispensed connected to said chamber, an outlet for said chamber, impact means for striking said diaphragm whereby some of the material within the chamber is ejected through said outlet, and a valve normally closing said outlet but opening in response to the pressure applied to the material in said chamber by said impact means.

Plating Rack

U. S. Pat. 2,333,907. R. Werrett, assignor to R. A. Lister & Co., Ltd. (England), Nov. 9, 1943. Apparatus for electrodepositing metal on an article having inner and outer faces to be plated, comprising a jig constituting a cathode, an inner anode arranged to lie within, and an outer anode arranged to lie surrounding the outside of the article for use simultaneously in plating its inner and outer surfaces, which jig is a structure of U-shape having an aperture in the middle of the base section thereof, means extending through said aperture for suspending the inner anode from and insulating it from the upper part of the jig, means for suspending the outer anode from and insulating it from the lower part of the jig, an annular block constituting a combined continuity and supporting member, on the upper side of which the article to be plated can be seated, the outer lower edge of which continuity member is chamfered and suspension means for securing said continuity member to the base section with the upper end of the article in electrical contact with the cathode, which suspension means comprises metal supporting arms that are attached to the continuity member and are adapted to extend each through a gap between spaced parts of the article supported thereon, said chamfered lower end directing electrolyte outwardly and upwardly around the outer surface of the article supported on said continuity member.

Plating Slide Fasteners

U. S. Pat. 2,334,054. P. C. Wooters, assignor to Talon, Inc., Nov. 9, 1943. In a method of electrolytic surface treatment of fastener members of slide fasteners including nonconducting stringer tapes with spaced interengageable metallic fastener members thereon, pulling up between the fastener members of a pair of tapes a flexible conducting foil strip, immersing the assembled stringers and strip in the electrolytic bath of an electrolytic treatment apparatus, attaching the foil strip to a terminal of the apparatus to form an electrode of the electrolytic treatment apparatus, and passing current through the apparatus to secure surface treatment of the fastener members uniformly electrically connected by the conducting strip.

Strip Pickling

U. S. Pat. 2,334,177. S. J. Dishauzi, assignor to National Steel Corp., Nov. 16, 1943. In a method of pickling continuous strip metal wherein the same is passed through a plurality of tanks in succession, the number of tanks being greater than the minimum number necessary under normal operating conditions for satisfactory pickling at minimum desirable speed of the strip metal, the steps comprising maintaining an acid pickling solution having a metal content less than an allowable maximum in all the tanks, dumping the first tank relative to movement of the strip metal when the metal content of the pickling solution therein reaches the allowable maximum, transferring the pickling solution from a subsequent tank relative to movement of the strip metal to the first tank, said subsequent tank being the one having the highest metal content at the time, replenishing the subsequent tank with fresh pickling solution, and maintaining the acid concentration of the first tank at least as high as that of the subsequent tanks until the metal content of the pickling solution in the first tank reaches a point near the allowable maximum.

Cleaning Sheet Steel

U. S. Pat. 2,335,196. M. C. Pecsok, assignor to The Osborn Mfg. Co., Nov. 13, 1943. The method of removing scale from a steel sheet which comprises spraying the sheet with water as it comes from the mill, such sheet being at a high temperature just insufficient to volatilize such water spray, passing such sheet through breaker rolls to break the scale into particles, flexing such sheet over a roll to raise the edges of such particles, and brushing the flexed portion of such sheet with a rotary brush disposed on an axis parallel to such roll to detach such particles.

Metal Spraying

U. S. Pat. Reissue 22,397. J. F. Meduna, assignor to Metallizing Engineering Co., Inc., Nov. 30, 1943. In the method for applying spray metal to a metal surface with a high degree of bond, the improvement which comprises conditioning such metal surface for spray metal bonding by contacting multiple small individual areas of such metal surface with at least one metal electrode, including establishing contact between such metal surface and such metal electrode, electrically heating the contacting surfaces of said electrode and said metal surface by means of an electric current flowing, under conditions of resistance heating, through said contacting surfaces, to firmly bond fused electrode material to said metal surface, and causing small amounts of electrode material to be left deposited on said metal surface, to thereby obtain a surface characterized by an irregular roughness with a multitude of projections with overhanging edges and minute craters with overhanging edges, and thereafter spraying metal onto the metal surface thusly conditioned.

Metal Spraying

U. S. Pat. Reissue 22,398. J. F. Meduna, assignor to Metallizing Engineering Co., Inc., Nov. 30, 1943. A spray metal coated, metal-surfaced article which comprises an article having a metal surface, a layer of spray metal, and, intermediate said metal surface and said layer of spray metal, fused metal deposited upon and integrally bonded to said surface by fusion to said surface and characterized by an irregular surface frozen from semi-liquid state with a multitude of projections with over-hanging edges and minute craters with over-hanging edges, at least the majority of said projections and craters being in interlock with spray metal particles of said layer of spray metal, and at least the majority of said projections being in size and spacing substantially of the same order of magnitude as the size of spray metal particles in the spray metal layer.

Metal Spraying

U. S. Pat. 2,335,316. A. P. Shepard, assignor to Metallizing Engineering Co., Inc., Nov. 30, 1943. A tool for producing a simulated sandblasted surface on metal for spray metal bonding comprising a piece adapted to be held in a machine tool holder, a shaft mounted in said piece and a plurality of toothed metal discs carried by said shaft and freely rotatable about the axis of said shaft, at least the majority of said teeth being metal splaying and peening teeth and each defining an apex angle of approximately 90°, the peening and splaying surfaces of the teeth of at least some of said discs being out of line with respect to the peening and splaying surfaces of the teeth of other discs, at least the majority of adjacent toothed discs having a side spacing substantially parallel to said axis of not in excess of approximately ¼" and the teeth of at least the majority of said toothed discs having a circumferential pitch of approximately 18 teeth per linear inch.

Pickling Inhibitor

U. S. Pat. 2,335,452. F. Schelling (Germany), vested in the Alien Property Custodian, Nov. 30, 1943. An inhibitor for acid baths for pickling metals comprising at least one substance selected from the group consisting of ammonium thiocyanate and thiourea the crystals of which are coated superficially with a condensation product of paraformaldehyde and aniline.

Electroforming

U. S. Pat. 2,335,774. C. A. J. Landry, Nov. 30, 1943. The process of making prosthetic articles by electrodeposition of metals including the steps of providing a cast of the member affected, applying a base layer of electric conducting material throughout said cast, masking parts of the cast not defining the member to leave exposed those parts of the cast defining the member, electrodepositing a heavy nickel bearing metal layer on said exposed parts, electrodepositing a layer of chromium bearing metal on said nickel bearing metal layer, stripping the base layer from the article, and electrodepositing a chromium bearing metal layer throughout the entire surface of the article for obtaining a close fit at the areas which have been stripped.

Stripping Electrodeposited Sheet

U. S. Pat. 2,335,776. H. C. Macan, assignor to Anaconda Copper Mining Co., Nov. 30, 1943. Apparatus for continuously stripping a thin sheet of electrodeposited metal from a rotating cathode drum solely by means of tension on the sheet comprising contact means engaging the stripped sheet and adapted to impart to the sheet sufficient tension to strip sheet metal from the cathode drum, and a curved stripping member of a length approximately equal to the width of the cathode face of the drum and disposed between the drum and the contact means in the path of the stripped sheet in such manner that the stripped sheet passes over the stripping member, the curvature of said stripping member being such that the central portion of the sheet passing over the stripping member is displaced outwardly beyond the edges of the sheet, whereby the stripping tension is applied to the sheet principally at the central portion of the sheet.

Abrasive for Blasting

U. S. Pat. 2,336,001. J. T. Eash and K. A. Eash and K. A. DeLonge, assignors to The International Nickel Co., Inc., Dec. 7, 1943. Cast iron grit containing about 2% to 2.5% silicon, about 0.75% to 1.5% nickel, about 0.25% to 0.5% chromium, the nickel and chromium being present in the ratio of about 3:1 to 4:1.

Corrosion Prevention

U. S. Pat. 2,336,020. H. J. Krase, assignor to Monsanto Chem. Co., Dec. 7, 1943. The process of treating metal surfaces which are susceptible to rusting, comprising projecting upon said surfaces finely divided particles of ferrophosphorous at such a velocity that said surfaces are simultaneously cleaned and rendered rust resistant.

Electrolytic Screen

U. S. Pat. 2,332,592. E. O. Norris, assignor to Edward O. Norris, Inc., Oct. 26, 1943. The process of producing a stencil, which consists in electroforming a base screen, superimposing thereon by electroplating a thin sheet of metal, applying to the thin layer a coating in the form of a design, electroplating a thick layer of metal on the uncovered areas of the thin sheet and continuing the operation until the thickness of the layer exceeds that of the coating, filling the open area of exposed coating with a readily removable material, electroplating on the first-mentioned layer a second layer of the same metal as the first-mentioned layer, removing the coating and the readily removable material, deplating the thin layer and arresting the deplating step as soon as passages are opened up leading from the design areas through to the exposed face of the base screen, the coating and the readily removable material both being passive to electroplating and not being deleteriously affected by the electrolyte used in the deplating operation, each electroplating step after the deposit of the said thin sheet of metal being arrested before the design areas have been closed.

Plated Electropolished Nickel

U. S. Pat. 2,336,568. H. A. Pray, assignor to Battelle Memorial Inst., Dec. 14, 1943. In the method of metal electroplating wherein a nickel surface other than bright or mechanically buffed nickel is first electrobuffed and then chromium plated, the improvement whereby a clear chromium plate is obtained, which comprises electrodepositing on the electrobuffed nickel surface a flash coat of fine-grain nickel sufficiently thin to retain the characteristically lustrous surface produced by electrobuffing, and then chromium plating directly upon said thin nickel flash coat.

Abrasive Blasting Machine

U. S. Pat. 2,337,048. R. B. Huyett and C. M. Gossard, assignors to Pangborn Corp., Dec. 21, 1943. Blasting means comprising a housing, means to transport workpieces to be blasted through said housing in one path and return said workpieces through said housing in a second path spaced from said first path in a predetermined plane, and a plurality of centrifugal blasting wheels in said housing positioned to blast said workpieces as they are transported along said paths, said wheels being spaced along one side of said paths and spaced apart in a plane substantially parallel to the plane of the paths of said workpieces, one of said wheels being positioned to direct its blast at an acute angle relative to the direction of travel of said workpieces and another of said wheels being positioned to direct its blast at an obtuse angle relative to the direction of travel of said workpieces.

Vitreous Enamel

U. S. Pat. 2,337,103. W. Heimsoeth and R. Weinig (Germany), vested in the Alien Property Custodian, Dec. 21, 1943. An enamel of the boro-silicate type having the following composition in parts by weight:

Borax	8.0
Feldspar	22.4
Quartz	26.0
Cryolite	12.4
Soda ash	6.1
Sodium nitrate	3.0
Calcium carbonate	5.1
Sodium titanium silicate	10.0

Scale Removal from Steel

U. S. Pat. 2,337,186. J. J. Caugherty, Dec. 21, 1943. In a method of producing a clean, oxide-free surface on wire and the like, the steps of passing a wire through a bath of molten glass to apply a coating of molten glass thereto, controlling the thickness and uniformity of thickness of said coating, cooling the glass coated wire, and then separating the glass from the wire by flexing the wire.

Tin Plating

U. S. Pat. 2,338,049. W. W. Murray, assignor to Continental Can Co., Inc., Dec. 28, 1943. The method of coating black iron with tin consisting in electrodepositing a layer of tin on the black iron, squeezing and drying said layer and subjecting the deposited layer to cold rolling with rolls from ninety to one hundred sceleroscope hardness and highly polished, said rolls rotating at uniform speed and under pressure from seven hundred to one thousand pounds per square inch, whereby the heat incident to rolling renders the tin malleable, permitting said electrodeposited layer to be compacted into a homogeneous layer strongly adhering to the black iron and having a continuous mirror-like surface.

Scale Removal from Steel

U. S. Pat. 2,338,165. J. C. Caugherty, Jan. 4, 1944. The process of cleaning scale from wire, rod, and other ferrous metal shapes, which comprises applying a coating of molten glass to the oxide-bearing wire, and cooling and contracting the coated wire until there is caused a sudden and violent separation of the glass coating from the wire with attendant separation of the scale, which is retained by the glass on separation thereof from the wire.

Hot Tinning Apparatus

U. S. Pat. 2,338,438. J. D. Keller, assignor to The Wean Engineering Co., Inc., Jan. 4, 1944. In an apparatus for tinning sheet steel including a tin pot, means for removing excess tin from the sheet metal comprising a pair of wiping rolls having bodies composed of a tube of flexible material deformable under the pressure of the liquid tin adhering to the sheet metal after its emergence from the pot, and means mounting said rolls for rotation.

Vitreous Enamel

U. S. Pat. 2,338,439. W. Kerstan (Germany), vested in the Alien Property Custodian, Jan. 4, 1944. In a method of producing an article having thereon a coating of clouded vitreous enamel having an opacity substantially greater than that which could be produced with the frit used and clay alone, and in which a substantial part of the increased opacity is contributed by gas bubbles retained in the enamel, incorporating in the enamel slip containing clay, less than 5% of a boron compound measured as boric acid and a gas-evolving agent which, upon the firing of the enamel, evolves gases which are retained in the enamel at the firing temperature thereof in the form of bubbles of such sizes and number as to contribute a substantial increase to the opacity, said gas-evolving agent being selected from the group consisting of vinyl compounds and polymers thereof.

NEW EQUIPMENT AND SUPPLIES

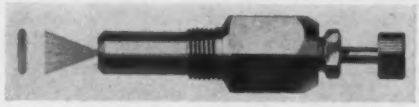
NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Rubber Coated Clothing

Industrial clothing coated with rubber, synthetic rubber or other synthetic materials has been added to its line, it is announced by E. F. Tomlinson, general manager of the Industrial Products Sales Division of The B. F. Goodrich Company, Dept. MF, Akron, Ohio. The line will bear the company's brand, widely known to industrial buyers of rubber goods, as well as consumers of tires, tubes and other rubber products.

Included in the new line are firemen's and policemen's coats, general purpose work coats, industrial coats and worker's leggings, work jackets, pants and hats. Garments will be made under limitations imposed by the War Production Board, governing the amounts of natural crude rubber, reclaim or synthetic rubber which can be utilized.

Professional Directory



New Lubricating Nozzle May Be Cleaned During Operation

For use in lubricating heavy gears or in chemical processes and other types of service, a new lubricating nozzle has been developed by Spraying Systems Company, Dept. MF, 4039 West Lake Street, Chicago 24. Using a special long-wearing, hardened steel orifice, the nozzle produces a flat spray pattern.

Construction of the clean-out needle on this nozzle makes it unnecessary to cease operation when orifice needs cleaning. This feature, plus the fact that the nozzle may be built of many materials besides the steel generally used in its manufacture, makes it highly adaptable. Various capacities and spray angles are available.

Air Cooled Hat

Industrial Products Company, Dept. MF, 2820 N. Fourth St., Philadelphia 33, Pa., provides the protection industry wants with the smart appearance women desire.

Adopted by many plants as the safest, most practical and attractive hat for their women workers. Completely covers the hair, guards

from entanglement in moving machinery and from dust and grime of manufacturing surroundings.

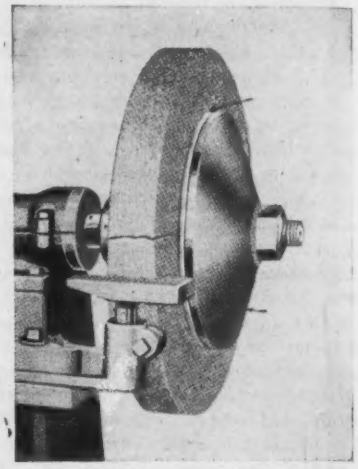
Shaped crown and visor of 100% wool felt with attached rayon snood that is instantly adjustable to fit all heads without disturbing any style of hair-do.

Crown is attractively ventilated by a perforated design as shown; with four eyelets in the visor placed close to the forehead to prevent pocketed heat.

Safety Washers

Industrial Products Company, Dept. MF 2820 N. Fourth St., Philadelphia, Pa., is marketing a safety washer designed to prevent accidents due to broken segments of a grinding wheel leaving the shaft.

They consist of 20-gauge steel discs to which has been vulcanized a surafce of specially compounded rubber, one washer



being applied to each side of the grinding wheel with the rubber adjacent thereto. When pressure of the outside steel flanges is applied, the rubber is forced into the porous surface of the wheel holding it firmly in place.

Also in this manner, the stress in the wheel, due to centrifugal force, is transferred to the safety washer, which in conjunction with the shaft carries the load.

Available for wheels having flanges up to 30″ diameter.

Illustration shows a 14″ diameter wheel, which after being broken in two pieces had a continuous run for five hours at 2250 RPM.

New Zinc Plating Solution

A special alkaline solution has been developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J., with which is used S-B Addition Agent for producing satin-bright to bright deposits, the degree of lustre depending on the choice of operating conditions.

In unagitated solutions the cathode current density range is from 10-45 amp./sq. ft. Maximum brightness is obtained with the solution temperature maintained at 70-75°F. The deposits are somewhat lustrous as they are taken from the plating bath. A satin-bright to full-bright finish is produced by dipping the work momentarily in a ½% nitric acid solution. Zinc-aluminum anodes are recommended.

New Blower

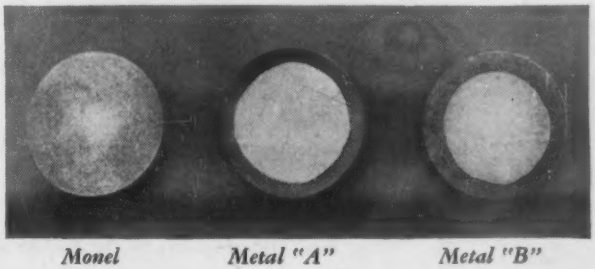
and cleaned. Finely ground steel surfaces

After 11 months' test in sulfuric acid pickling Monel Rods show 3 to 1 strength advantage

The best measure of a tie-rod's merit is its ability to keep a pickling tank tight after a period of service.

This requires high corrosion resistance to maintain (1) the strength of the rod and (2) the structure of the threads on the end.

This illustration shows a cross-section of three metal rods... Monel, and two other metals frequently used in pickling... tested by the Research Department of a large steel mill after 11 months' service.



Monel *Metal "A"* *Metal "B"*

The rods, 1" diameter by 18" long, were bolted through a wooden rack and tested under actual plant conditions in a tank used for pickling hot-rolled sheets. The sulfuric acid content of the pickle was maintained at from 5% to 7% by weight. The operating temperature was 180° F.

After a total exposure of 331 days, or 2448 hours actual pickling time, metals "A" and "B" showed serious deterioration with only a residual core of the original metal remaining (see photos). The Monel rod had remained smooth, and was only slightly discolored. Load tests revealed that the Monel rod had over 3 to 1 strength advantage. The strength of rods "A" and "B" had been seriously impaired.

MAXIMUM LOADS SUSTAINED BY SPECIMEN TIE-RODS AT END OF TEST

Metals	*Maximum Load* (*Average of 4 or more rods*)
Monel	52,800 lbs.
Metal "A"	15,300 lbs.
Metal "B"	14,500 lbs.

The condition of the threads was noted and measurements made. At the critical point on the threads *ahead* of the nut, rods of metals "A" and "B" suffered attack that destroyed their usefulness. The Monel rod showed no significant attack at this vital spot, thus maintaining its full usefulness.

Tough, strong and highly resistant to corrosion, Monel showed in these tests, as it has in other tests and in years of practical service, that it is uniquely fitted for long-lived pickling equipment.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street **New York 5, N. Y.**

INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL
Sheet... Strip... Rod... Tubing... Wire... Castings

New Blower

A new all-purpose blower especially developed for solving problems of machine designers has just been announced by the Ilg Electric Ventilating Co. of Chicago, Illinois.

By making available a wide variety of special mountings on a mass-production line of blowers, the new No. 68 Utility Blower brings manufacturers of machines with built-in air handling equipment a unit that is practically custom-built for each application without the cost of special tools, dies and handling.

Eight different arrangements are available, which include Blower only; Blower and

Stand only; Blower and Inlet Flange only; Blower and Discharge Flange only; Blower, Inlet and Discharge Flange only; Blower, Stand and Inlet Flange only; Blower, Stand and Discharge Stand only; or Blower, Stand, Inlet and Discharge Flanges.

The Housing and Stand of the No. 68 Utility Blower are made of die-stamped steel, assuring a most durable unit. The zinc die-cast multi-blade wheel is dynamically balanced—one of the reasons for its unusually quiet and highly efficient operation. Wheel and motor are direct-connected, resulting in an extremely compact unit for engineering into another machine.

It is powered by a series wound, 110 volt, single phase, 60 cycle, sleeve bearing type AC motor that operates at 3400 r.p.m. A length of cord is brought out of the motor for making connections.

A new bulletin has been published containing performance curves, dimensions and operating data. Free copies are available from the home office of Ilg Electric Ventilating Co., Dept. MF. at 2850 N. Crawford Avenue, Chicago 41, Ill.

Rust Preventive

A combined rust preventive, cleaner and fingerprint neutralizer is announced by E. F. Houghton & Co., Dept. MF, Philadelphia, for use in internal plant protection of steel parts between processing or machining operations.

This product—Cosmoline No. 805—is intended not to remove rust, but to neutralize the causes of corrosion, particularly acid perspiration from workers handling the parts. It also is effective in protection against corrosion caused by a chemical atmosphere, fumes, etc., or high humidity.

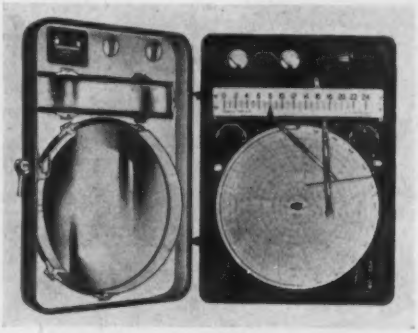
It is pointed out that final application of a rust preventive after completion of the part or assembly will not be effective if rust has already started while the part was being processed—ground, machined, heat treated and cleaned. Finely ground steel surfaces are invitations to corrosion which will begin before the final protective coating can be applied. Sweaty fingers can cause much damage to such parts unless they are protected.

Cosmoline No. 805 is a fluid product which conforms to requirements of Ordnance Technical Manual TM 38-305. It will meet and exceed 24-hour salt spray and 100-hour humidity tests.

New Model Pyromaster

The Bristol Company, Dept. MF, announces that they have redesigned their Pyromaster Self-Balancing Potentiometer. The new Model 431 instrument has a universal wall or flush mounting case that is considerably deeper than the previous Model 440M, and has an internal hinged panel on which are mounted pen and indicator drive mechanism, and, in the case of electric controllers, the control contacts or proportioning slide wire, or in the case of air control, the complete new convertible-type air operated control mechanism.

This new deep case and inner panel make it possible to service or replace any part or portion of the instrument without disturbing any other part. It also makes it possible, in the case of electric type controllers, to include the control relays in the instrument thus eliminating considerable external wiring.



A heavy-duty pen-drive motor gives more torque for operating control contacts and other similar functions, especially under conditions of poor line voltage regulation.

The indicating scale on the indicating-recording model has been changed to a horizontal wide band instead of the rectangular dial-type provided on the Model 440M.

The stepping relays and the slide wire in the potentiometer circuit have been enclosed in a dust-proof bakelite housing, and a heavier power supply has been provided.

Another change is that a standard cell type of manual standardizing circuit now replaces the voltmeter type originally supplied.

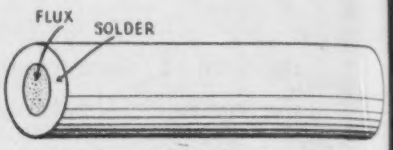
The Model 431 Pyromaster uses the same basic principle as previous models, providing a self-balancing round-chart recording potentiometer that has no continuously moving mechanical elements, is unaffected by vibration, and needs no lubrication.

Bulletin P1200 describes in detail the construction, operation, and application of the new design, and is available by request from The Bristol Company, Dept. MF, Waterbury 91, Conn.

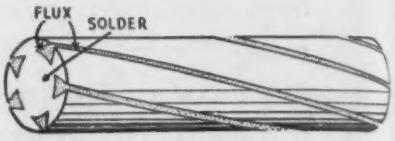
Fluxed Wire Solder

A new type of fluxed wire solder, which contains flux in longitudinal grooves on the surface rather than in the conventional core, has just been placed on the market. According to the manufacturer, the product represents the first basic improvement in fluxed wire solder design since the introduction of this type of material a number of years ago.

The new material, called Fluxrite and put out by National Lead Company, Dept. MF, 111 Broadway, New York, is said to



CONVENTIONAL FLUX-CORE WIRE SOLDER



NEW TYPE OF WIRE SOLDER WITH FLUX IN GROOVES

overcome completely an inherent disadvantage of regular cored solders which supply flux and solder to the surface simultaneously. Since the flux in the new product is outside rather than inside, it liquefies and flows onto the work before the solder melts. This insures thorough and complete fluxing and results in stronger and better solder joins.

In addition to pre-fluxing, the new solder also is said to guarantee an unbroken flow of flux. Interruptions in the flow sometimes occur with cored solders due to gaps or voids in the flux core. Since the new product has more than one flux-filled groove, there is naturally a continuous flow at all times.

An additional advantage claimed comes from the fact that the flux supply being outside the wire, is always visible to the user and can be checked quickly and readily. Gaps or voids in ordinary cored solders are not detectable until after soldering begins.

The new product, which contains a recently developed special flux, comes in the same diameters as regular cored solder. It is available in two compositions designated as Red Stripe and Green Stripe. These designations refer to the color of the flux which has been specially dyed in each case for easy identification.

Plating on Plastics

The new process of metal plating on plastics, glass, etc., developed by Precision Paper Tube Company has been taken over by Electro Plastic Processes, Dept. MF, 2035 West Charleston St., Chicago 54, Ill.

Installation of special equipment to facilitate production runs are going steadily forward. Operation on a limited basis has been in progress for several months.

Business Items

Appointment of *Milton Kutz* as acting assistant general manager of the Electrochemicals Department of *E. I. du Pont de Nemours & Company*, effective January 1, was announced by *Frank S. MacGregor*, general manager of the department.

The appointment marks the return of Mr. Kutz to the post which ill health forced him to relinquish 18 months ago for a term of less active service.

Born at Logansport, Indiana, Mr. Kutz was educated in the public schools of New York. He joined the Roessler and Hasslacher Chemical Company in 1897, rising during 33 years of service to vice president and a director of the firm.

Upon the merger of that company with Du Pont in 1930, Mr. Kutz became director of sales. When the company was established as the R. & H. Chemicals Department in 1933, he was named assistant general manager of the new department.

The *Hanson-Van Winkle-Munning Co.*, of Matawan, N. J., has been appointed sales representative of the *Illinois Water Treatment Co.*, manufacturers of water de-conizers for the metal finishing industry, and is prepared to furnish full preliminary information to manufacturers operating electroplating plants who are interested in the use of a pure water for their operations.

Edward Magnuson, president of the *Swedish Hospital* in Brooklyn, N. Y., and also founder of the *Magnuson Products Corporation*, manufacturers of Permag Cleaning Compounds, presided recently at the dedication at the hospital of a plaque on which are inscribed the names of 30 members of the staff now serving in the armed forces.

E. M. Allen announced his retirement as president of the *Mathieson Alkali Works, Inc.* effective January 1, 1944, and the election of *G. W. Dolan* as his successor. Mr.

New Book

Tungsten. By K. C. Li and Chung Yu Wang. Published by *Reinhold Publishing Corp.* New York, N. Y. 1943. 325 pages. Price $7.00.

A very complete work. The first 135 pages deal with the history, geology, and ore dressing of tungsten. The following 114 pages cover the metallurgy, chemistry and analysis of the metal.

Despite the large amount of space given to the geologic occurrence of tungsten ores, persons interested in metal finishing will find much pertinent basic data. Information and references on the electrolysis of tungsten compounds both fused and in solution are given.

Correction

January Issue of Metal Finishing

In the second column of text page twelve, seven lines above the heading "Limitations and Scope of Polishing and Buffing", a decimal point has been misplaced, 0.002″ is the correct figure rather than 0.0002″ as shown.

Allen will continue to hold his office as chairman of the board of directors of the company.

Mr. Allen became president of the company in 1919 and since 1938 has been chairman of the board and president.

Mr. Dolan joined the Mathieson organization in 1930; has held various positions of responsibility, and in 1941 was elected executive vice president of the company.

Enoch Perkins has been elected Vice-President of the *Mutual Chemical Company of America* in charge of the company's Mining and Ore Department.

Mr. Perkins has had wide mining experience. In recent years, in addition to supervising the company's mining operations in New Caledonia, he has visited the South African fields in Rhodesia and the Transvaal, as well as the rich Turkish mines.

Michael B. Dwyer, district sales manager in charge of the St. Louis office of the *Pennsylvania Salt Manufacturing Company*, has retired from active duty with the company as of December 31, 1943. Mr. Dwyer, who is held in the highest esteem by his associates in the company as well as by many hundreds of customers and business acquaintances in the St. Louis area, closes a most enviable record of 58 years of active duty with the company which is one of the country's largest and oldest manufacturers of heavy chemicals and chemical specialties.

Donald W. Graham, who has been with the Pennsylvania Salt Manufacturing Company for 13 years, comes from the Chicago office to succeed Mr. Dwyer as district sales manager at St. Louis.

The *Pennsylavnia Salt Manufacturing Company* of Philadelphia announces the retirement of *North Emory Bartlett* as Vice President effective December 31, 1943. Mr. Bartlett, who is a native of Easton, Maryland, started with the Salt Company November 10, 1894 as a lye salesman in the Chicago Office. He came to the Philadelphia Office about 30 years ago as Special Sales Agent and on January 1, 1925 was made General Sales Manager of the Company. January 1, 1928 he became Vice President in charge of sales and continued actively in this capacity until January 1, 1942, when he relinquished his duties in charge of sales but remained Vice President with additional duties as Assistant Secretary and with other special duties.

Mr. Bartlett is a member of many organizations in the chemical industry including the Chemists Club of New York, the Compressed Gas Manufacturers Association and the Technical Association of the Pulp and Paper Industry. In the course of his business career he has travelled in nearly every part of the United States. His cordial personality, his ready sense of humor, and his reputation as a raconteur of unusual ability have made him friends wherever he has gone.

Mr. Bartlett leaves the Pennsylvania Salt organization to retire to his home on the Miles River, just outside of Easton, Maryland, where he hopes to enjoy for many years the life of a "Country Gentleman".

Emanuel Cohan, President of the *Cohan-Epner Co.*, 142 West 14th Street, New York City, has left for an extended vacation at Safety Harbor, Fla. This company is one of the leading contract electroplaters specializing in gold and silver work, and in metallizing plastics and other non-metallics, as well as the application of all commercial

electroplated, lacquered and enameled finishes on metals.

On November 15 *Mr. Robert S. Gray* joined the staff of *The Lea Mfg. Co.* as assistant chemist and consultant. Mr. Gray has had many years experience in electroplating work and is very widely known throughout Connecticut in electroplating circles. He has been a member of the New Haven Branch of American Electroplaters' Society since his active connection with the electroplating industry.

The appointment of *James H. Jewell* as assistant manager of Industry Departments was announced by the *Westinghouse Electric and Manufacturing Co.* Mr. Jewell, manager of the company's Agency and Specialties Department since 1940, will continue to head that division.

In his new position Mr. Jewell will supervise all activities of the Industry Departments except Application Data and Training and General Contract, which will report direct to *F. H. Stohr.*

A native of Chestertown, Md., Mr. Jewell attended Pratt Institute and Temple University before enrolling in the Westinghouse graduate student course in 1920. His first assignment, after completing the course in 1922, was in the small motor section at the East Pittsburgh Works. He soon went to the Philadelphia Office as sales assistant, later became a salesman in the building section and in 1930 was made manager of the construction industry section.

After returning to East Pittsburgh in 1938 as manager of the public works and communications sections, Mr. Jewell was shortly transferred to Philadelphia as manager of agency sales of the Middle Atlantic district. In 1939 he came back to East Pittsburgh as assistant manager of the agency sales department.

J. S. Dixon has joined the staff of the *Lea Manufacturing Company* as an abrasive engineer doing field and consulting work on engineering problems connected with burring, brazing and polishing of metals. Mr. Dixon comes to Lea from *Russell & Erwin Mfg.*

Co., Division of *American Hardware Corp.*, New Britain, Conn., where he served as production and methods superintendent for the past twenty-four years. He has been a member of the Waterbury Branch of the American Electroplaters' Society for the past twelve years.

The appointment of *Frank Sanderson MacGregor* to be general manager of the Electrochemicals Department has been announced by *E. I. du Pont de Nemours & Co.*

The appointment became effective January 1, 1944, when Mr. MacGregor, since February, 1942, assistant general manager of the department, succeeded *Dr. E. A. Rykenboer* who retired December 31 on account of ill health.

A native of Lawrence, Mass., Mr. MacGregor attended Greenwood School and Hyde Park School in Boston and was graduated from Massachusetts Institute of Technology with the degree of B.S. in 1907. He was engaged in mining and metallurgical work with the U. S. Smelting Co. and the American Zinc Lead & Smelting Co. from 1907 through 1914, and was a consulting engineer in Boston from 1914 to 1916.

He joined the Du Pont Company in 1916 becoming successively assistant director of the Development Department, where he helped to lay the foundation for the company's expansion from the explosives into the diversified chemicals field; control manager of the former paint department, in 1922; assistant director of the Development Department, 1923 to 1928, serving also as managing director of the Hotel Du Pont Company from 1926 to 1928.

He was general manager of the Acele Department of the former Du Pont Rayon Company, 1928 to 1934; president and general manager of Ducilo S. A. Productora de Rayon, Du Pont affiliate in Buenos Aires, 1934 to 1939; served on special assignment from 1939 to 1941, becoming director of the

company's priorities division in June that year.

Mr. MacGregor is a member of The Franklin Institute, Philadelphia; the Arnold Fish and Game Preserve, Canada; Delta Tau Delta fraternity; and the Westminster Presbyterian Church, Wilmington. His home is at 2307 Ridgeway Road, Wilmington.

Dr. Rykenboer was born in Rochester, N. Y., and entered the University of Rochester from which he received his B.S. degree in 1912, followed a year later by his master's degree. After four years combining study and an instructorship at the University of Michigan, that institution conferred upon him the degree of Ph.D. in Chemistry.

Starting as a research chemist for Roessler & Hasslacher Chemical Company at Niagara Falls, N. Y., in 1917, he became senior chemist in 1921 and superintendent of production in 1926. He became a director and general superintendent in 1930 when Roessler & Hasslacher was acquired by Du Pont. He was elected vice president in 1931 and executive vice president in 1932. He subsequently became assistant general manager of the R. & H. Department in 1933 and on June 2, 1933, succeeded C. K. Davis as general manager. In 1942 the R. & H. Department became the Electrochemicals Department.

Dr. Rykenboer is a member of the American Chemical Society, the American Electrochemical Society, the American Institute of Chemical Engineers, and of Sigma Xi and Phi Lambda Upsilon fraternities. His home is in Lewiston Heights, N. Y., near Niagara Falls.

George B. Beitzel, Vice President in charge of sales of the *Pennsylvania Salt Manufacturing Company*, Philadelphia, announces that the Company has divided the New York territory as follows:

F. G. Rodenburgh will cover New York City, Long Island, Westchester and Putnam Counties in New York, and Fairfield, New Haven and Middlesex Counties in Connecticut.

Charles A. McCloskey will cover Northern New Jersey as heretofore, and in addition will cover Connecticut and the eastern half of New York State with the exception of the counties in those states covered by Mr. Rodenburgh.

Both Mr. Rodenburgh and Mr. McCloskey, who are representatives for the Company's line of chlorine, caustic soda, and other heavy chemicals, will maintain their headquarters at the Company's New York Office.

One of the country's most unusual war enterprises, an aircraft parts plant in a race track is now at peak production at the *Del Mar Turf Club*, Del Mar, Calif. The same officers who operated the race track, headed by *Bing Crosby* and *Pat O'Brien*, film actors, are directing the Turf Club's aircraft division.

Hundreds of women from Del Mar and surrounding communities are producing wing assemblies for Flying Fortresses manufactured in the Douglas plant in Long Beach where all necessary plating, finishing and polishing of the parts is handled.

MacDermid Incorporated of Waterbury, Connecticut, manufacturers of metal cleaners and distributors for cleaning, plating and finishing equipment, announce the appointment of *Mr. Arthur Logozzo* as a Technical Service Engineer. Mr. Logozzo brings to this organization a broad knowledge of the metal finishing industry. He is recognized as a leading authority on hard chrome plating and has addressed many of the various technical societies on this subject.

Mr. Logozzo won first prize for an exhibit of chrome plated dies and molds at the 1941 American Electroplaters' Society Convention, at Boston. He also won the General Electric Coffin award in 1942 for unusual and persistent effort in developing a new and efficient method of chrome plating molds. This is the highest award General Electric gives for contributions to the electrical art.

Articles written by Mr. Logozzo have appeared in the American Electroplaters' Society Monthly Review, Metal Finishing, Modern Plastics, Tool & Die Journal, British Nickel Bulletin, Canadian Metals, Iron Age and many others.

Mr. Logozzo's talents are available to all New England manufacturers for the installation of plating equipment or for the servicing of existing equipment and plating processes.

News from California
By FRED A. HERR

American Electroplaters' Society
LOS ANGELES BRANCH

A promise made at a meeting last fall by *Earl Coffin*, chairman of the educational committee, to present the branch at an early session with a speaker qualified to discuss the much-debated subject of heat-treating and its relation to the plater was carried out at the January 10 meeting of Los Angeles Branch, A.E.S., when Mr. Coffin introduced *H. H. Littleford*, engineer of the *Standard Heat Treating Co.* of Los Angeles as the first of two speakers.

In the half hour talk and the 45-minute discussion period which followed, Mr. Littleford supplied the answers to many of the heat-treating problems that have vexed local platers. His subject was "*Heat Treatment of Steel Prior to Finishing*".

As a preliminary to the main subject, the speaker defined the various processes in a heat treating plant, such as annealing, tempering, carburizing, quenching, etc.

Any discussion of hardening, Mr. Littleford declared, must start with the conception that there are inherent qualities in steel which withstand hardening. He then explained the various methods of quenching. Water, he said, can be used as a quench for shallow hardening of alloys. Oil quenching he stated, eliminates distortion in the material, the best results from an oil quench being obtained in a range of 90 to 140 F. The brine quench, he pointed out, is used to achieve higher hardening than could be obtained with a water quench.

The molten salt bath, the speaker declared, is a comparatively new quenching method which is excellent in the process of hardening steel for high-speed drills and tools, and is additionally a desirable method of quenching in that it permits no distortion.

Mr. Littleford pointed out that all iron and steel has a very definite grain structure which undergoes physical and chemical change during heat treating. These changes, he explained, are caused by allotropy which changes the structure internally without external physical change.

Mr. Littleford declared that the science of metallurgy has made tremendous strides in the heat treating of metals and alloys during the past decade, and especially since the outbreak of the war. He said that alloys are being used today that were considered inconceivable for practical use ten years ago, and many of them, he predicted, will continue in use after the war.

Mr. Littleford concluded with the suggestion that platers having criticism of work attributable to heat treatment of a metal part consult the heat treater from whom the part was obtained for a mutual discussion of the problem that will probably lead to a satisfactory solution.

The speaker was subjected to a bombardment of questions at the conclusion of his talk. To the query of what type of oil should be used for quenching, he stated that the

type of oil depends on the type of steel or alloy or the quenching rate the operator desires to obtain. Very light oil, he said, should be used for carburized parts, a 100 viscosity oil for work on tools.

To the question of why a carburized steel does not scale like an oil-hardened steel he offered the explanation that the method of hardening usually determines the amount of scale. In the case of oil-hardened parts, he said, the scale may be picked up in the draw.

The fact that scale is harder on some steel than on others was attributed by Mr. Littleford to the way the heat treating was done—a neutral atmosphere in one case, perhaps a reducing atmosphere in the next.

Ways and means of removing scale produced by the burned oil on steel parts were discussed at length. Various members of the branch stated that the oil left on the parts in the machine shop creates the greatest problem for the plater. One shop foreman said the problem of burned-oil scale in his plant was so vexing that he has had to resort to sandblasting to remove the scale.

The suggestion was offered that, since it is a question of cleaning, a quench in the form of a slightly acid bath might produce results. It was also proposed that the use of a hydrochloric and sulphuric pickle and making the work anodic should descale the parts in about 30 seconds. Several platers pointed out, however, that this method might be suitable for parts in the form of sheets that can be hung up, but would not be practical for small parts, such as nuts and bolts.

The second speaker of the evening was *Harold Sheppard*, supervisor of plating for the *Norris Stamping & Manufacturing Co.* He delivered a talk on *"Zinc Plating of Deep Draw Work"*, and explained the method used by the Norris Co. for plating cartridge holders drawn from low-carbon steel.

Forty-one members and guests attended the meeting. Visitors included *Everett Thornton, Magnetic Process Co.; C. B. Morris, Long Beach Plating Co.; Ray O. Weaver, General Electric Co., Ontario; Roy Lostutter and H. J. Delaney, Hard Chrome Engineering Co.; H. E. Alexander, DuPont Co. Niagara Falls, N. Y.; R. J. Magee, Standard Heat Treating Co., Los Angeles; Kenneth Sutherland, Turco Laboratory, Chicago;* and *Robert Strathan, North American Aviation Co., Inglewood, Calif.*

Applications for active membership were received from *Roy B. Lostutter* and *Harry J. Delaney* of the *Hard Chrome Engineering Co., Everett Thornton* of *Magnetic Process Co.*, and one for reinstatement from *Calvin D. Moore* of *Long Beach Plating Co.*

Discussion was held on the matter of members making suggestions to the chairman of the educational committee concerning the type of speakers the monthly meetings should feature. Discussed also was the question of whether one or two speakers should be programmed, Ernest Lamoreaux recommending that the present two-speaker system, which has been in vogue for several months, be continued for a while.

Walton C. Sundmark, formerly a partner with his brother Roger in the *Sundmark Supply Co.*, Los Angeles, plating material distributors, has been commissioned a lieutenant (j.g.) in the Navy at San Diego, Calif., where he is assigned to communications work. Since the dissolution of the Sundmark Supply Co. following Walton's entrance into the Navy, Roger has been superintendent of plating and finishing for the *Norris Stamping & Manufacturing Co.* of Los Angeles.

The Bedwell Plating Co. in Los Angeles has added a new 1500 ampere generator to its plant equipment to supplement one of similar size being used for zinc, cadmium, nickel and copper plating of aircraft and signal corps parts which the plant is handling on sub-contracts.

Wayne Enameling & Plating Corp., formerly of Detroit, Mich., has moved to Los Angeles and is now operating in a plant of 7500 square feet at 831 Crocker St., equipped to handle enameling and plating of aircraft parts. Head of the firm is *Donald E. Matthews.*

Robert L. Crinnian, president, *American Society of Industrial Engineers*, was guest of honor at a dinner meeting in the Hollywood Athletic Club during his recent visit to Los Angeles to assist in the organization of a local chapter of the *ASIE.*

During the recent visit to Los Angeles of *Lieut. Gen. William T. Knudsen, K. T. Norris* of *Norris Stamping and Manufacturing Co.* presented the general with the one millionth steel cartridge case made at the plant. The cases are power drawn from low carbon steel and zinc plated in what is probably one of the largest dip finish plating setups in California.

Joseph T. Ryerson & Son, Inc., distributors of steel products with plants in Chicago, St. Louis and eight other mid-western and Atlantic Coast cities, has opened a district sales office in the Architects Building, Los Angeles, with *Lee Bergstrom* in charge.

Pacific Tube Co., Los Angeles, has announced the appointment of *John Manildi* as manager of sales. *Copperweld Steel Co.*, Warren, O., has selected *Thomas Hutton & Son*, San Francisco, as its Northern California representative.

The S & M Lamp Co. is making alterations involving a cost of several thousand dollars in its factory at 116 West 36th Place, Los Angeles. In the pre-war days, when such exhibits were still possible, the silver, gold, nickel and chrome plated products of the S & M Lamp Co. were among the finest items in the plated products show which formed a part of the annual educational session of Los Angeles Branch of the *A.E.S.*

Among current improvements being made at the plant of the *Radiophone Co.*, 7901 Woodley Ave., Los Angeles, is the erection of a roof over the dip tank.

John Merigold, head of the Merigold Plating Co. of Los Angeles and *Mrs. Merigold* celebrated their 32nd wedding anniversary in the company of a group of close friends at their home, 6023 Coney St., Los Angeles, on Saturday night, January 8.

Mr. Merigold and Miss Caroline Shaw were married in 1911 at Newark, N. J. At the time, Merigold was head of the *Merigold Electroplating Co.* which was situated on Chestnut St. near New Jersey Railroad Ave. in Newark. One of the men who worked for him in Newark 32 years ago (Frank Shaw, a brother of Mrs. Merigold) is still active in plating work in Southern California. He is employed in the plating and finishing department of the *Douglas Aircraft Co.'s* Long Beach plant.

Kenneth Sutherland, senior chemist in the Chicago laboratory of *Turco Products, Inc.*, arrived in Los Angeles early in January to make a tour of Southern California defense plants for the purpose of studying metal processing procedure, plating and other production methods in aircraft and shipbuilding plants. His plans called for a stay of a month to six weeks, during which time he was to make his headquarters at the Los Angeles main offices of Turco.

Arrowhead Brass Products Co., 8823 Mettler St., Los Angeles, is erecting a shop addition, 88 by 87 feet in dimension, at an estimated cost of $14,500.

Two new factory additions costing a total of $2500 are going up at the plant of the *Universal Microphone Co.*, 424 Warren Lane, Los Angeles. One of the new structures measures 24 by 14 feet, the other 14 by 30 feet.

Other new building and expansion programs include the following: *Industrial Research Laboratory, Ltd.*, 527 East Sixth St. Los Angeles, new factory and office building, $1500; *National Aircraft Equipment Co.*, 1819 Barranca St., factory addition costing $3,000; *Pacific Scientific Co.*, 1430 Grande Vista Ave., addition to factory, $6,500; *Pacific Screw Products Co.*, 6920 Stanford Ave., factory addition, $2,000.

Official Notice of intention of engaging in business under the following firm names has been filed:

George A. Simpson and *Lee Davis* as the *Advance Plating Co.*, 1313 East 61st St., Los Angeles.

Van A. Parker as the *Universal Plating Co.*, 836 Columbia St., San Diego.

John J. Hall as *Metal Control Laboratory*, 911 E. 59th St., Los Angeles.

George E. Ransom as the California Western Laboratories, 552 South Figueroa St., Los Angeles.

Charles A., Robert D. and *William C. Hayward* as the *Precision Manufacturing Co.*, 2210 Temple St., Los Angeles.

Daniel T. Wight and *Clyde A. Warne* as the *Electronic Engineering Co.*, 1301 Oak Grove St., Los Angeles.

Simon Ladkin and *S. A. Haberman* as the *Western Grinding Co.*, 3303 Beverly Blvd., Los Angeles.

The plant building of the *Angelus Plating Works*, 9310 S. Broadway, Los Angeles, was recently damaged by fire. Contract in the amount of $500 for repairs has been let.

Western Galvanizing Co., now at 2701 So. Soto St., Los Angeles, has contracted for the demolition of its former factory buildings at 2554 East 25th St., where activities of the firm were carried on for a number of years in a warehouse-like structure which also housed the firm's offices. One of the shop buildings was moved from 25th St., to the new location on Soto St. at a cost of $5,000.

Obituaries

Walter Linley Hague

Walter Linley Hague died on Dec. 17, 1943, at his home in Pittsburgh, Pa. He was 71 years of age.

Mr. Hague, who had spent the last few years in retirement, was one of the pioneers in the contract and jobbing electroplating industry, having operated Walter E. Hague and Son, Inc., which had been founded by his father, Walter Edward Hague, in 1869. This company was in continuous operation for over 65 years, until Mr. Hague's retirement. He was widely known not only in the Pittsburgh district, but also nationally, having taken an active part in the work of the American Electroplaters' Society.

Mr. Hague leaves a widow and a son, Louis M. Hague, who is vice-president in charge of sales of the Hanson-Van Winkle-Munning Co. of Matawan, N. J., manufacturers of electroplating equipment and supplies.

William Stratton

The many friends of William Stratton, Bridgeport, Conn., will regret to learn of his death. He was found dead on New Year's Day.

Bill was a son of one of the oldest platers in the United States. His father, who was one of the first to plate nickel under a license from Dr. Isaac Adams, was a plater at Bradley and Hubbard's, Meriden, Conn., in 1861.

Bill was a member of the Bridgeport Branch of the American Electroplaters' Society.

Technical Publication

The *American Standards Association* announces the publication of its new list of standards. There are more than 600 standards listed, of which 64 have been approved or revised since the last price list was printed (April, 1943). The standards cover specifications for materials, methods of tests, dimensions, definitions of technical terms, procedures, etc.

One important phase of the work built up during the 25 years that the ASA has been in existence is in the field of safety engineering. The new list includes 95 safety standards.

American Standards are constantly revised to keep up with the advances in industrial methods. This list represents the cumulative work of the past 25 years in practically every engineering and industrial field.

Since the war, the ASA has been working very closely with government agencies and with the Armed Services to provide specifications for certain of the materials necessary to our war effort. Because these standards are developed through an accelerated procedure, they are designated as American War Standards. These are listed separately, and to date there are 40 already completed and many more under development. These war standards have been produced in the field of safety work, machine tools, quality control, photography and radio, just to mention a few. Every government order is based on specifications: standards are used to accelerate production, conserve materials, maintain a balance between quality and price control, simplify inspection, contracting and sub-contracting. All of them are designed to relieve shortages of time, material and man-power.

In each case, the standards approved by the ASA represent general agreement on the part of maker, seller, and user groups as to the best current industrial practice. More than 600 organizations are taking part in this work.

The complete list of American standards should serve as valuable reference material to engineers, manufacturers, purchasing agents, etc. It will be sent free of charge to anyone interested in this work. Requests should be addressed to the American Standards Association, 29 West 39th St., New York 18, N. Y.

Manufacturers' Literature

Nozzles

Specially-built and standard nozzles are described completely in a new catalog just published by *Spraying Systems Company*, Dept. MF, 4039 West Lake St., Chicago 24, Ill. This 32-page book is full of up-to-date information designed to help the spray nozzle user select the nozzle best suited to the job he wants done. Copies are sent on request.

Washing and Drying Machines

Industrial Washing Machine Corp., New Brunswick, N. J., has published a twelve-page booklet which contains many facts and illustrations of their washing and drying machines. This booklet may be had by writing to the company.

Rouges

E. Reed Burns Mfg. Co. has published a new bulletin on Burnsrouges. This bulletin lists some of their standard grades and also some of the special purpose grades. The bulletin may be had by writing to the company at 40-42 Withers St., Brooklyn 11, New York.

Cleaners for Effective Metal Cleaning

Bulletin C-105 from the *Hanson-Van Winkle-Munning Co.*, Matawan, N. J. This new bulletin deals with the selection and use of cleaners made from water solutions of alkalies, soap-alkali mixtures and soaps. These solutions remove oils, greases and waxes of animal, vegetable and mineral (petroleum) origin, and the inert solid materials contained in them. These inert materials may be: (1) metallic chips or borings from machining; (2) abrasive ingredients of polishing or buffing compounds; (3) various dirts incident to producing and fabricating the objects cleaned.

A total of 19 special cleaners are described including 8 alkali cleaners of the soaking type for steel, aluminum, zinc, brass, copper, nickel-silver and soldered work; 6 electric cleaners for steel, brass and other non-ferrous metals, and 5 different soap cleaners for removing buffing compounds from brightly polished surfaces of brass, aluminum and die castings.

The Bulletin also includes a very interesting discussion of metal cleaning processes in general, giving in simple language the fundamentals involved in this type of work.

Copies may be obtained on request from the Hanson-Van Winkle-Munning Co., Matawan, N. J.

White Rouge

Tamms Silica Company, 228kv N. LaSalle St., Chicago, Illinois, has published a six-page circular on their White Rouge. This circular gives data on application, speed of spindles, how to avoid imperfections, etc. The circular may be had by writing to the company.

Adjusting Goggles

An illustrated booklet entitled "Right on the Nose", which explains in detail the quickest, easiest methods of adjusting non-prescription industrial safety goggles so that workers can wear them in comfort, has been published by the *American Optical Company*, Dept. MF, of Southbridge, Mass. Free copies can be obtained by writing the concern direct.

The booklet was prepared for safety directors, medical directors, or other persons assigned the job of fitting goggles. Objective behind the booklet is to help prevent eye accidents caused by workers refusing to wear improperly fitted safety goggles which may be uncomfortable to wear.

A training film on the same subject and bearing the same title has also been produced by American Optical for goggle fitters. This new sound motion picture 16 mm. film is available on a free loan basis, and prints can be secured direct from the company.

FEBRUARY, 1944

ORGANIC FINISHING

SECTION OF METAL FINISHING

LACQUERING • ENAMELING • JAPANNING • PAINTING

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Duranite is the trademark name of Zapon's great family of heat reactive metal finishes. Duranites have unsurpassed qualities and are famous for their contribution to speed in production with rugged wearing characteristics. If you finish metal or plastic products, look into the DURANITES . . . they will more than meet the needs.

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ORGANIC FINISHING

SECTION OF METAL FINISHING

FEBRUARY, 1944

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Cover Photograph

Photo taken at Willys-Overland Co., Toledo, Ohio, shows Jeep chassis having the finish baked in infra-red oven. —*Courtesy of Fostoria Pressed Steel Corp.*

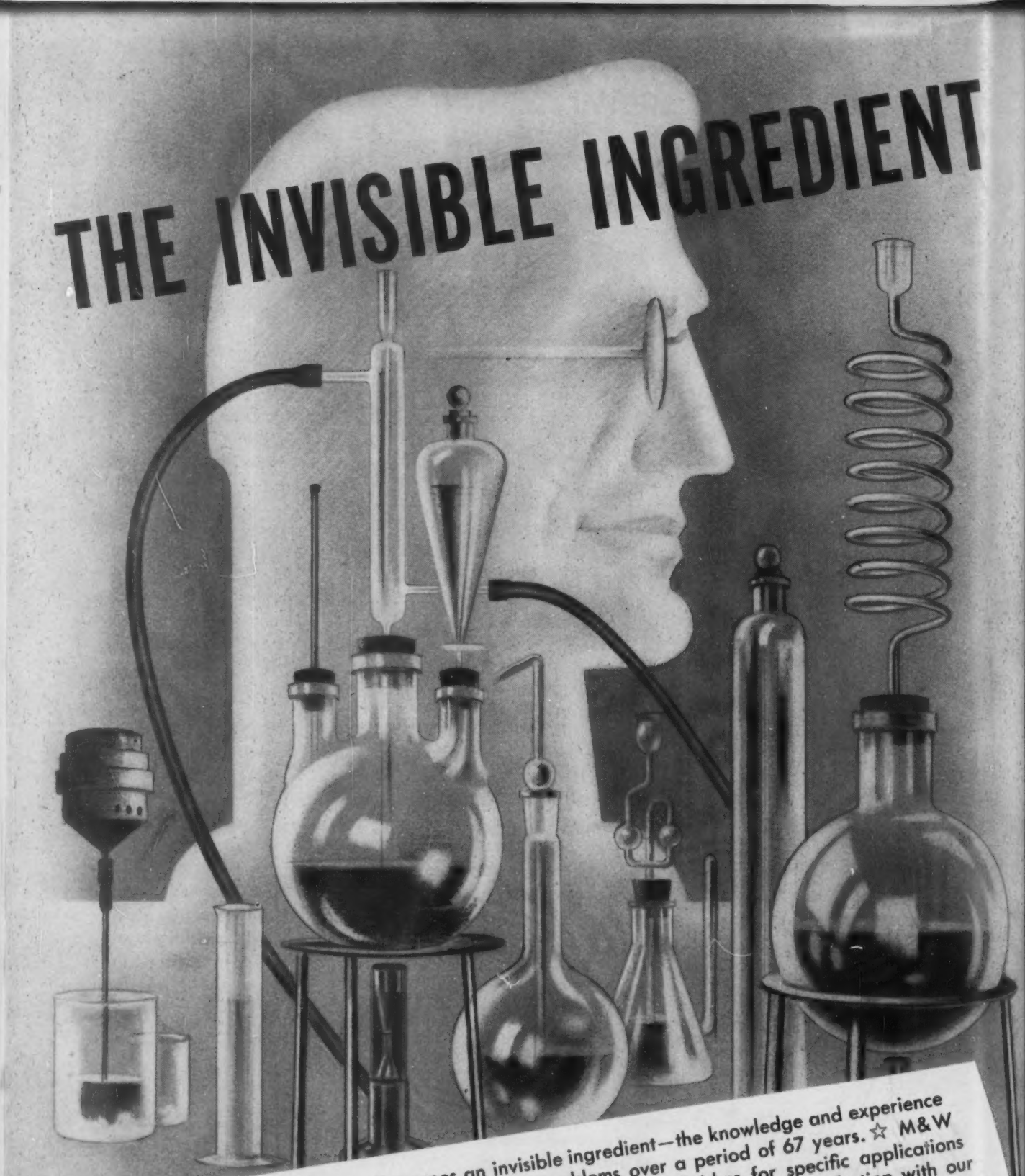
The Mandrel Test

There has been much criticism of certain tests included in specifications for organic finishes on the basis that test results cannot be translated into terms of actual finish performance. One of the most discussed tests is the bend test in which a finished panel is bent over a rod or series of rods of various diameters to determine the resistance of the finish to distortion produced by bending. Those who object to this particular test contend that finishes rarely meet such bending in actual service. Furthermore, it is said that, by choosing the proper test conditions such as thickness of panel, diameter of mandrel, speed of bending, etc., it is possible to obtain good or bad results as desired with most any finish.

We agree, at least in part, with the objections to the mandrel test. Finishes are not usually bent 90 degrees or 180 degrees in service. Again, it is obviously unfair to judge one material to be good and another bad when a change in test conditions might possibly show the reverse. On the other hand, tests such as the mandrel test are not entirely worthless. It must be remembered that results from most finish tests must be taken as general rather than specific indications of finish performance in the field. Many test results may not mean much by themselves. However, in combination with results of other tests and interpreted by experienced observers, they become the means of predicting the suitability of a finish for an application whose conditions may or may not resemble test conditions.

The mandrel test is a useful one. It has its limitations, of course. What finish test does not? Indeed, if all finish tests which did not give exact quantitative information on field performance were eliminated, there would be few tests left by means of which to judge the worth of a finish. To those who would advocate scrapping the mandrel test, let us repeat our statement in a previous issue that finishing is not an exact science. The mandrel test may not be perfect but it is useful.

L. H. LANGDON, *Publisher* • WILLOUGHBY G. SHEANE, *Associate Editor* • T. A. TRUMBOUR, *Business Manager*



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NEWS FROM WASHINGTON—

By George W. Grupp

METAL FINISHING'S Washington Correspondent

Aluminum Paint Restrictions Relaxed Restrictions on aluminum paint were relaxed by Supplementary Order M-1-g as amended December 24, 1943. In Paragraph (e) of this amended order permission is granted to use aluminum paint for seven classes of purpose without approval. Manufacturers of aluminum paint are now only required to make quarterly reports to the WPB. This revised order also provides that "*After December 31, 1943 no person other than a producer shall, without specific authorization in writing of the War Production Board, deliver to any other person in any one month more than one gallon of aluminum composition or two pounds of aluminum pigment except to fill an order rated AA-5 or higher, or except to fill an order which he has been specifically authorized to fill on Form PD 312, Form WPB-599, or other specific authorization in writing of the War Production Board issued prior to December 31, 1943.*"

Army Industrial College Reopens With Course On Contract Termination The War Department opened the Army Industrial College on January 3, 1943 which had been in recess for the past two years. The college opens with a two week course in contract termination, including disposal of excess industrial property. Undersecretary of War Robert P. Patterson opened the session. Among those who shall lecture to the Army officers are Bernard M. Baruch, director of the advisory unit on war and postwar adjustment policies; John Handcock who is Mr. Baruch's assistant, and Charles E. Wilson, WPB executive vice chairman.

Civilian Chemical Distribution In January The Chemicals Bureau of WPB announced on January 12, 1944 the permitted distribution of chemicals for civilian uses during the month of January 1944. *No acetone was permitted for civilian metal finishing purposes.* All requests were granted for ethyl acetate, 91% and 99% isopropyl alcohol and shellac. The Bureau granted permission for the allocation of 630,211 gallons benzol for solvents; only 35% of the glycol ether requests for lacquer solvents were granted. Pentaerythritol was allocated as follows: for maleic alkyd resins 53%; ester resins 46%; miscellaneous resins 37%; rosin ester resins 34%; and protective coatings 57%. All requests for civilian uses were denied for secondary butyl acetate, secondary butyl alcohol, for urea and melamine aldehyde resins for protective coatings, for isobutyl alcohol for lacquers and thinners, and for isopropyl acetate for unclassifiable lacquers.

Ethyl Alcohol Industry In Jamaica An ethyl alcohol industry was recently established in Jamaica, British West Indies. Rejected bananas will be utilized as a raw material to produce ethyl alcohol.

Industrial Wax Prices The OPA fixed the ceilings on imported industrial waxes for protective coating purposes on January 10, 1944 in issuing Amendment No. 2 to Maximum Price Regulation No. 264. The prices on crude imported beeswax were fixed as follows: Imported sun-bleachable other than African 44.75 cents a pound; imported non-sun-bleachable other than African 41.50 cents a pound; and African (either sun-bleachable or non-sun-bleachable) 37.50 cents a pound. In addition the amendment provides the maximum prices for sales in the United States of such waxes should be calculated upon war risk insurance rates for certain areas. For example, a one and one half per cent base rate applies to shipments from Central and South America, Caribbean area and North America. The three per cent rate now applies to "shipments from points other than South, Central, and North America and the Caribbean area, rather than for shipments solely from Africa."

Lac Crops in India Fall in 1943 The latest reports from India indicate that her crop of Baisaki lac will amount to about 372,000 maunds (1 maund equals 82.28 pounds) in 1943 as compared with 1,038,250 maunds in 1942. The Jethua lac production in 1943 will amount to 67,000 maunds as compared with 102,500 maunds in 1942.

Linseed Oil Requirements In a recent meeting of the Linseed Crushers Industry Advisory Committee and the Food Distribution Administration it was revealed that the minimum requirements of linseed oil in 1944 will be 1,084,000,000 pounds of which 710,000,000 pounds will be for domestic industrial uses; and 374,000,000 pounds for edible needs of our Allies.

Metal Container Useage Extended One hundred sixty-nine different products may be packed in metal containers in 1944 according to Conservation Order M-81 as amended January 4, 1944. Among the new items which may be packed in metal containers are alcohol, inflammable cleaning fluid, polishes and waxes, roof coatings, turpentine, lacquers, shellacs, varnishes and varnish removers.

Polish and Wax Industry in Bolivia A plant is being established at Purapura, La Paz, Bolivia by Bartoluc and Tonell for the production paints and related products such as oils, polishes, waxes, and similar materials.

Service Trade Bulletin To Be Issued The Office of Price Administration will soon issue a Service Trade Bulletin which will explain in detail how to compute permissible adjustments of service charges for the repair of certain appliances and equipment such as gas unit heaters, furnaces, industrial equipment, and business machines as provided under Supplementary Service Regulation No. 22 to Maximum Price Regulation No. 165 as amended December 21, 1943 and effective December 27, 1943.

Solvent Production In Palestine A method has been developed in Palestine by which 63 per cent of solvents can be obtained from citrus fruit peelings. Ethyl alcohol, butyl alcohol, acetone, and acetic acid are also being produced in Palestine by fermenting citrus fruit peelings or pulp residue after extracting pectin or essential oils.

Titanium Dioxide Order Extended Conservation Order M-353 which covers the distribution of titanium dioxide was amended on December 24, 1943 to bring barium, calcium base, titanium pigments and titanated lithopone within the provisions of the Order. But in making this extension of control it only covers pigments containing more than 30 per cent titanium dioxide. The amended order definition of titanium oxide excludes the word "pure"; and the titanium oxide content in pigments has been reduced to 12 per cent to come within the terms of the definition.

Tung Oil Production In Brazil Falls Because of a frost in September, it was recently reported, that the 1943 production of tung oil in Brazil will be considerably less than in 1942.

Zinc Oxide Order Amended General Preference Order M-11-a as amended December 29, 1943, which controls deliveries of lead-free zinc oxide of producers and dealers, provides this material shall not be used except for the manufacture of such items as abrasive wheels, chemical treatment for metal surfaces, certain paints, and zinc plating.

Courtesy Pan American Airways System

Clippers vs. Corrosion

By J. T. HENDREN

Chief Chemist, Pan American Airways System, Miami, Fla.

THE operation of an international airline presents many difficult problems, operational, traffic, and maintenance. It is with one phase of the last problem that we shall deal, namely, the corrosion protection and appearance of aircraft. The slogan of the Pan American World Airways Maintenance Department is "Safety and Efficiency with Economy" and this slogan keynotes the entire work of the Maintenance Department. Safety is concerned in this problem since the inroads of corrosion can dangerously reduce the mechanical strength of the various light alloys used in aircraft construction. Efficiency and economy are obviously concerned because it is important, especially in wartime, to keep the planes in the air the maximum possible time. A plane on the ground is neither helping the war effort nor paying its way.

The Pan American World Airways System operates five major overhaul bases in the continental United States and also several major overhaul bases at strategic foreign points in the aerial network. The types of planes which operate from these main bases vary greatly, ranging all the way from the familiar DC-3 transport landplanes to the giant transoceanic Clippers of the type that carried President Roosevelt and his advisors on the overseas part of the historic flight to the military conference at Casablanca last year. After victory, it will be possible to tell the full story of Pan American's wartime activities but, for the present, only the commercial service side of the picture can be covered.

Although corrosion protection is important for any type of aircraft, it is particularly so for amphibians and flying boats, exposed as they are to salt water and spray during taxiing, take-off, and landing. Therefore, we shall discuss principally the corrosion protection of these two types of planes. All the maintenance functions, including engines, propellers, instruments, control mechanisms, radio, as well as refinishing, must be performed on the airplane in a minimum of time as it stands in the hangar. The size and shape of a Clipper does not lend itself to being rolled into a paint shop for refinishing and the paint crew must transport their equipment to the plane and must coordinate their activities with those of the other specialized crews working on the plane. However, some things are more conveniently removed from the plane and taken to the paint shop. For the handling of such items, as well as many pieces of airport equipment, each main base maintains a small but well equipped paint shop. The bulk of the work, however, must be done on the airplane where it stands.

Basic Finish

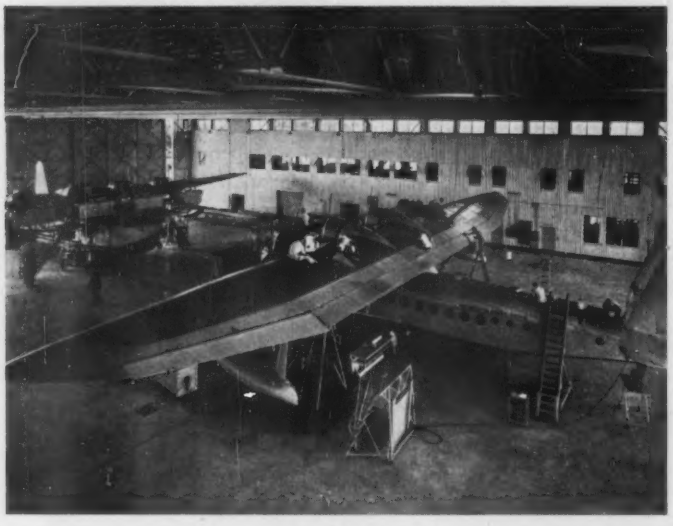
All the major exterior surfaces of the airplane are metal, the only exceptions being rudders, ailerons, and other "control surfaces," so that the base for the protective and decorative finish is anodized dural, an excellent paint base and one on which the primer coat is readily bonded. The anodic coating itself possesses great corrosion protective qualities but our principal ally in fighting the battle of corrosion is the AN-TT-P-656a Specification zinc chromate primer. This primer, first developed about ten years ago, was quickly adopted by the aircraft industry and after passing through several revisions is still, due to its great merit, almost universally used as an undercoating. The Pan American practice is to spray one thin coat of this material over the previously carefully cleaned surface and let dry a minimum of 30 minutes and a maximum of three hours. This is followed by three spray coats of aluminized lacquer, Specification

AN-TT-L-51. The customary proportion of aluminum used is two pounds per five gallons of vehicle. The quick drying properties of this finish enable each succeeding coat to be sprayed with a minimum of lost time. The entire hull and wing is covered with this finish with the exception of the hull bottom below the water line which is zinc chromate primed and finished with a heavily brushed coat of black glyceryl phthalate enamel.

The walls and surfaces of the cabin interiors are of metal and fire-retardant doped fabric. The structural members of the wing and tail surface interiors are given two light spray coats with the same zinc chromate primer as the exterior surfaces, except that approximately one-half pound of aluminum powder per gallon is incorporated. This system is highly protective for use on any surface where appearance is not a factor. Such interior surfaces are also susceptible to corrosion since it is impossible to entirely seal them from salt water or spray which may enter during landings and takeoffs. The "bilges," or the interior surfaces below the cabin floorboards, are likewise protected with aluminized zinc chromate and since no boat is absolutely water-tight, small cloth bags containing about one pound of potassium dichromate are laid at the lowest point in each water-tight compartment into which the hull is divided. Thus, any salt water which may enter will dissolve some dichromate which successfully passivates its corrosive action.

Maintenance of Finishes

When one of the Clippers returns to its main base from a run during which it has been away from two days to four weeks, it is hosed down thoroughly to wash off any salt deposits which may be adhering to exterior surfaces. The



Courtesy Pan American Airways System
Cleaning and touch-up operations on plane exterior.

Inspection Department then determines what work must be done to repair the effects of normal wear and tear and restore it to perfect flying condition and the PAA standard of cleanliness. As far as the finish is concerned, inspection is made for evidences of corrosion around the rivet heads, along the joining surfaces of the hull plates and structural members, breaks in the paint film due to abrasion from floating objects and other causes, and any marks or blemishes resulting from usage. Instructions are then issued to the shops describing the necessary work and this work is assigned to the proper crew on what is known as the "work sheet." This sheet explains the nature and location of the work to be done. The foreman then assigns specific items to each man who does the work and, after signing the work as completed, is checked out by his foreman. An inspector then gives the final okay on each item before the aircraft is released for flight service. Rivet heads, if only slightly corroded, may be cleaned off to the bare metal, reprimed, and repainted. If the condition is severe, the corroded rivets are removed and new ones installed. Corrosion on hull plate "faying surfaces" presents a bigger problem and replacement of such plates constitutes a major operation. The same applies to even greater extent to structural members. However, preventive maintenance has reduced this type of replacement to very infrequent intervals. Abrasions in the paint film are reprimed and re-top coated. Poor appearance due to spots and stains is quickly restored by a light aluminum lacquer spray coat blended into the surrounding finish. Such touch-up work may cover only a small area or it may include an entire side of a hull. Since weight increase is an important consideration of airline maintenance, and since total weight must be rigidly controlled to meet Federal Civil Aeronautics Authority regulations without sacrifice of payload, it is necessary that this extra paint weight be stripped off periodically and the surface refinished. This operation is rarely performed on the whole airplane at once. Instead, several major panels are done at one time and the remainder spread over subsequent periods at the main base. In this way delay in readying the planes for service is avoided. The stripping operation is difficult since it involves vertical and under-surfaces on the airplane. Furthermore, mechanical aids such as scrapers are not used as damage to the metal surface might result. Certain types of paint and varnish removers are also impractical and it is necessary to depend on such materials as are high enough in viscosity to stay in place long enough for the solvents to attack the paint film. A stiff fibre brush assists this operation to some extent without harming the surface.

Landplanes

The protection of landplanes from corrosion obviously presents a lesser problem than flying boats. No organic protective finishes are used on the exteriors of landplanes since the skin is fabricated from sheets of highly polished Alclad. This thin coating of high purity aluminum bonded to the dural base furnishes a surface which is excellently corrosion-resistant without the use of any organic finish.

The Pan American insignia and certain stripes on the fuselage, wings, and tail surfaces are painted in dark blue enamel. The cabin interiors are of metal and fire-retardant doped fabric and ordinarily can be cleaned with a mild cleaner. When this fails to completely restore them, they are resprayed with pigmented lacquer of the proper color.

Dope Finishes

In addition to the protection of metal exterior surfaces, portions of the wings of flying boats, as well as rudders, stabilizers and other control surfaces, are covered with fabric and doped. On such planes, past practice has been to apply about six coats of clear dope by brushing, one aluminum pigmented brush coat, and three or four aluminized spray coats. On landplanes, only the rudders, ailerons, and elevators are doped fabric and four brush coats of clear dope followed by three spray coats of aluminum pigmented dope

Courtesy Pan American Airways System

Routine servicing of plane, including refinishing where necessary.

are customarily applied. At each main base are stationed several small training planes, the fuselage, tail and control surface of which are doped fabric. A somewhat heavier dope system is used on these planes.

At most of the main bases high relative humidities are the rule rather than the exception and this necessitates the use of considerable retarder in the dope to reduce blushing. Even with this precaution, there are many times when surfaces must be wiped down with rags moistened with retarder between coats to remove blush and water droplets. Doping under such conditions is a troublesome and expensive procedure and we have been experimenting with hot doping methods which appear to offer many advantages over the older cold doping processes. For instance, the total number of coats can be reduced to five. This may make possible a saving of as much as fifty per cent in application time. Also, the weight per square yard is reduced from 11-12 ounces to 8 and blushing is much reduced.

Laboratory Testing of Finishes

A materials testing laboratory, the System-wide headquarters for the quality control of many of the products which the Company purchases, is situated at Miami. Investigations and studies are conducted here in connection with the use of aviation fuels and lubricants, metals and alloys, cleaning agents, and, of course, organic finishes receive their share of attention. It has been found advantageous to be able to select, by means of laboratory and small scale tests, from a large variety of commercial products those most likely to give superior performance in actual usage. Of course, the final criterion is a service test conducted under actual airline operating conditions. However, on many materials such a test is time consuming, expensive, and difficult to control. By means of the "weeding out" practice, inferior or inadequate products can be more quickly detected and their installation or application on the aircraft avoided. Panel exposure tests under tidewater conditions have been found to be one of the most effective means of studying different systems of finishes, particularly for flying boats. By experience, a relationship has been gradually established between the behavior on the test rack and the actual performance in service. For the testing of finishes not intended for use in contact with salt water, a test rack at a higher level is used where tropical heat, direct sunlight, and rain provide a severe trial for any finish. However exposed, test panels are periodically inspected and evaluated for adhesion, protection against corrosion, and retention of color and gloss.

We have not yet reached the point where we can say that we have perfect corrosion protection. However, we believe that, accelerated by the war, many products are being developed in the laboratories and plants of manufacturers which will be of great assistance in overcoming the protective finish problems incident to the intense development of post-war aviation.

ACETONE

Problem

WHAT are the hazards of acetone and what precautions are necessary in its use?

Hazards

The hazards are those of fire, of explosion and possibility of poisoning by contact with the liquid or by inhalation of the fumes.

Discussion

Acetone (dimethyl ketone) is a colorless, volatile and flammable liquid with an ethereal odor. It burns with a clear flame without producing any carbon deposits. The products of complete combustion are carbon dioxide and water. Its flash point varies from 4 degrees below zero Fahrenheit to 35 degrees above. From 2 to 13 per cent of the fumes in air forms an explosive mixture. Acetone mixes readily with water, alcohol, chloroform and ether. It is obtained by dry distillation of wood; by decomposition of acetates; and by catalytic decomposition of acetic acid vapor in the presence of coke containing alumina. Acetone is extensively used as a solvent in the preparation of varnishes, paints, resins, gums, lacquer, etc. It is also extensively used as a solvent for acetylene under pressure. The regulations of the Bureau of Explosives classify acetone as a flammable liquid and require that the small cans, iron drums and tank cars in which it is shipped must bear a red label.

Symptoms of Poisoning

The toxicity of acetone or its cumulative action is not great. The fact that it is liberated readily by the respiratory, urinary and intestinal systems is one factor which prevents acetone from causing blood poisoning unless great quantities of it are absorbed. There are three avenues of absorption, the respiratory which comprises about 95 per cent of the intake, and the alimentary system and the skin, about 5 per cent.

A prolonged inhalation of small quantities of acetone fumes causes irritation of the respiratory tract, coughing, headache and slight fainting attacks. The chief symptoms which follow inhalation of large quantities of acetone fumes are dryness of the mouth and throat, slight dizziness, nausea, incoordinated movement, loss of coordinated speech, "laughing jags," and later drowsiness, frequent urination, loss of memory and, in extreme cases, coma. Continued contact of acetone with the skin dissolves the skin fat and causes the skin to become so dry and irritated that a mild dermatitis may follow.

Susceptibility to acetone poisoning varies greatly in individuals. Repeated blood examinations of individuals who have worked with acetone have not shown effects other than a slight anemia. Some individuals who have worked for years in an atmosphere of 5 to 6 per cent acetone fumes do not show any ill effects. Others, particularly those with some bodily ailment such as diabetes, high blood pressure, or liver trouble or those who are tuberculous, anemic or addicted to the use of alcoholic drinks, have shown a rapid response to absorption of acetone fumes.

First Aid Treatment

When a person has inhaled small amounts of acetone fumes for a continued period and displays any of the slight symptoms of poisoning, he should be removed to the fresh air and the effects of the inhalation will usually disappear in a few hours. In case of inhalation of large amounts of the fumes, the patient should be removed to the fresh air and a physician summoned. In all cases of acetone poisoning, it is best to secure the services of a physician familiar with the effects of acetone.

Precautions

Persons exposed to contact with acetone fumes or liquid should coat the skin with a lanolin base cold cream or with a vegetable gum such as tragacanth or acacia as a protection against the solvent action of the acetone.

Workrooms in which acetone is used should be thoroughly ventilated and, if possible, an exhaust system should be installed to remove the fumes at their point of origin.

Workers exposed to the fumes should wear non-ventilated goggles to protect the eyes. They should also wear a gas mask equipped with a canister filled with an absorbent for organic vapors to protect the respiratory organs.

Workers with diabetes, acidosis, high blood pressure, liver trouble, or those who are tuberculous or anemic, or addicted to the use of alcoholic drinks, should not be assigned to work with acetone.

No smoking or open flames should be permitted in rooms where acetone is used or stored. Signs calling attention to such prohibitions should be conspicuously posted in those rooms and at the entrances.

Artificial lighting of workrooms and other places where acetone is used or stored should be by means of incandescent electric lamps enclosed in explosion proof globes.

All electrical equipment, such as motors, switches, starters, etc., should be installed according to the requirements of Article 32 of the National Electrical Code. ("Regulations of the National Board of Fire Underwriters for Electric Wiring and Apparatus as Recommended by the National Fire Protection Association.")

All possible precaution should be taken to prevent static electricity accumulations in rooms where acetone is used or stored.

Only non-ferrous tools should be used to open acetone containers.

Acetone should be handled and stored in accordance with "Regulations of the National Board of Fire Underwriters for the installation of Containers for Storing and Handling Flammable Liquids. Recommended by the National Fire Protection Association" or "Flammable Liquids—Industrial Storage and Use" of the Associated Factory Mutual Fire Insurance Companies.

(The above is from Industrial Data Sheet D-Chem. 23, issued by the National Safety Council, Chicago, Ill. Similar data on other solvents and on subjects of interest to the finishing industry will be published during the current year.—Ed.)

A New Recording Viscometer for Paint Consistency Measurements

By C. R. Wicker[1] and J. A. Geddes[1]

SYNOPSIS

A new recording viscometer, combining the principles of the modified Stormer and the McMichael instruments, is described. A cylindrical container is rotated at constant speed, the liquid within imparting torque to a paddle connected with a spring. A lever arm records the consistency upon a moving chart. Speed of rotation can be varied from 30 to 285 rpm.

The instrument has been calibrated in grams per 200 rpm. on the modified Stormer, in Krebs units, and in absolute units for viscous liquids. Calibrations are essentially straight-line functions. Using one spring only, the viscometer covers a range of 100 to 950 Stormer grams per 200 rpm., 60 to 135 Krebs units, or 5 to 45 poises, which includes the practical range of paint consistencies. Springs of different characteristics can be used to extend the range.

Stress-strain curves obtained on this instrument are similar to comparable data from modified Stormer viscometer data. Unlike the Stormer, however, the recording viscometer can be used to obtain a continuous record of consistency. It is therefore possible not only to measure thixotropic and rheopectic paints, but also to follow the thickening of water sensitive systems, effect of bodying agents, and similar phenomena of interest to the paint chemist.

Less skill and experience are required to operate the recording viscometer, and a series of determinations can be made somewhat more rapidly than on the modified Stormer. The new viscometer therefore appears suited for control work as well as research consistency measurements.

THE consistency of paint systems is an important physical property, because of its relation to brushing, flow, and settling. Since most paints cannot be classed as truly viscous materials, it is customary to measure consistency by means of instruments which can subject a paint to different rates of shear. A simple viscometer of the Ostwald type, for example, is not suitable. Instruments which have been employed more or less successfully by paint chemists include the Ford cup,[2] Parlin cup,[3] Gardner-Parks Mobilometer,[4] and the modified Stormer viscometer.[5] The cup types are used at only one rate of shear, and therefore are no more suitable for expressing paint consistency than is the Ostwald capillary tube instrument. The Gardner and Stormer instruments, however, can be used at widely different shear rates, to furnish valuable information on the rheology of paint systems. Of these instruments, the Stormer is somewhat more easily cleaned and operated, and is meeting with increasingly favorable consideration from paint technicians.

There are numerous consistency problems which cannot be solved even by these variable shear instruments, however. Among these may be mentioned the phenomena of thixotropy and rheopexy (change of consistency upon agitation). The effect of time upon consistency obviously cannot be determined by the usual methods. Also, the effect of addition agents upon consistency can only be high spotted by use of available practical instruments.

For this reason, it was considered advisable to design a viscometer which would retain the desirable features of the commercial instruments previously mentioned, and also would permit continuous recording of consistency, thus extending its range of usefulness for paint measurements. Such an instrument was designed by the senior author and developed by the Brabender Corp. in accordance with our requirements.

Description of the Instrument

The instrument in its present form is shown in Fig. 1. It comprises a circular "table" which is rotated at a constant speed, to which a pint can be fastened by means of set screws. A "submerged" paddle[6] of the type used on the modified Stormer viscometer is pivoted coaxially with the table, which can be raised or lowered so as to immerse the paddle to the proper depth in the liquid being measured. The submerged paddle is marked to indicate this depth. The liquid in the rotating can imparts a moment tending to rotate the paddle, the moment being measured by the angular displacement of a spring. A lever arm connected with this spring is provided with an inking mechanism, which draws a continuous line upon a chart moving under the pen at a constant speed. By this means a continuous record of consistency can be obtained over a long period of time.

One end of the spring which opposes the torque is con-

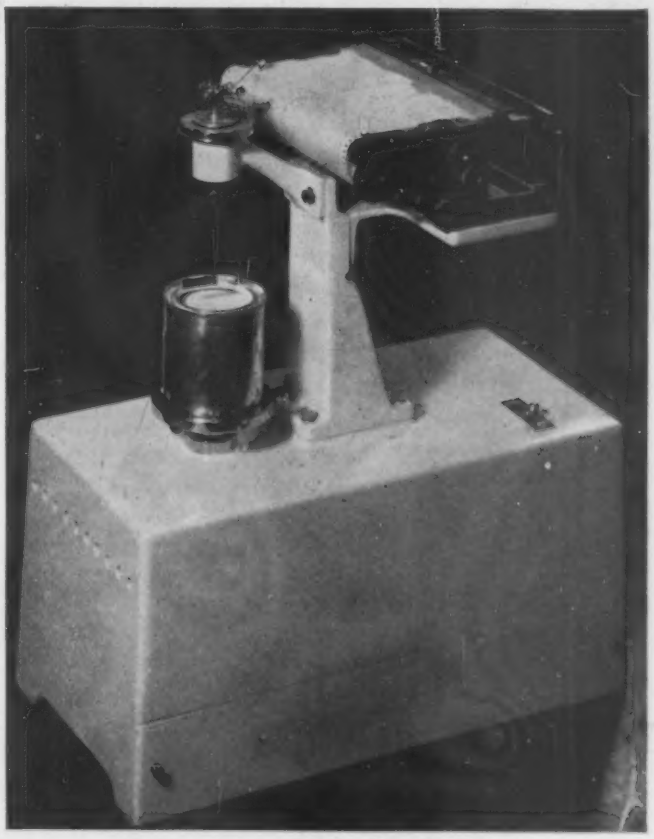


Fig 1. Recording Viscometer.

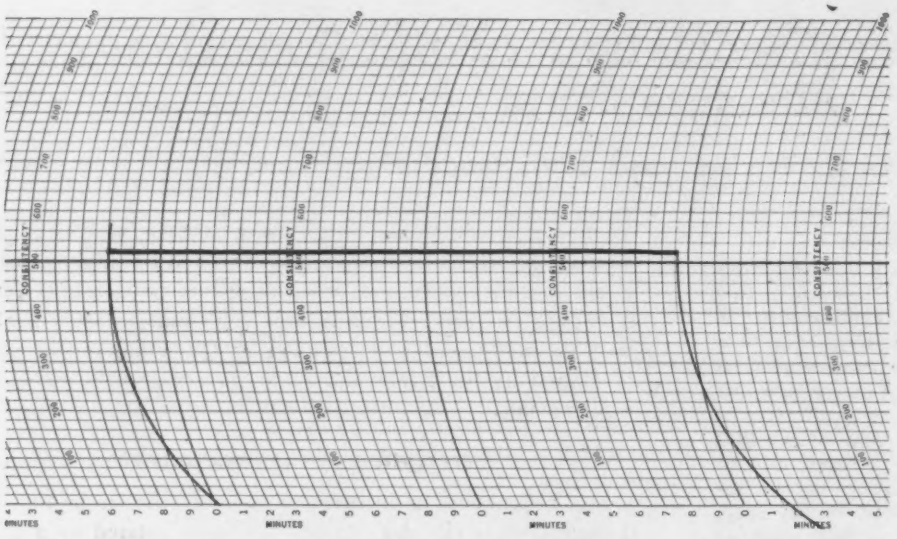


Fig. 2. Normal paint at 200 rpm.

nected to the pivoted paddle shaft by means of a small arm, while the other end is fastened to the frame. Set screws are likewise used for fastening this spring, so that it is easily replaceable if springs of different sensitivity are needed to extend the range of measurement. The paddle shaft is provided with stops which prevent damage to the spring through imposition of excessive torque. The paddle itself is also removable, in order that different types may be inserted for special purposes.

The instrument is built upon a rectangular base casting, to which is bolted a casting which supports the recording mechanism and the pivoted paddle and spring. Inside the base casting, a constant speed a-c. motor is housed, whose shaft is extended down to permit the attachment of a set of four pulleys (cast as one unit). A V-belt connects these pulleys with another set of pulleys tapering in the opposite direction, which drive the shaft on which the turntable is mounted.

By simply changing the position of the V-belt, it is possible to rotate the table at speeds of 100, 140, 200, and 285 r.p.m. If lower speeds are desired, the pulleys can be removed from the shafts and positions reversed, whereby driving speeds of 80, 60, 42, and 30 r.p.m. can be obtained.

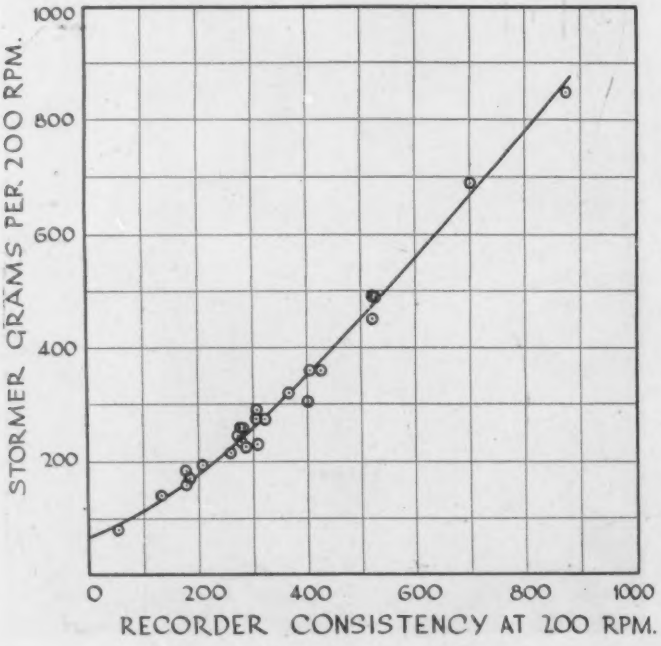


Fig. 3. Recording viscometer calibration curve.

The recording mechanism is likewise driven by a constant speed motor. The chart ordinarily moves at a speed of 2 cm. per min. If a long record of consistency is desired, it is possible to reduce the speed by a factor of 1:4 simply by changing the position of two gears in the front of the instrument.

Method of Operation

A spring suitable for the consistency range under consideration is fastened to the frame and to the pivoted paddle shaft, so that the lever arm containing the inking pen lies upon the zero line of the chart.

A pint can of material to be measured is placed upon the turntable and fastened by means of three screws. The table is then raised until the liquid in the can is level with the mark on the submerged paddle and is fixed in this position by tightening a set screw through the collar at the base. The V-belt is placed upon the pulleys so as to give the desired speed of revolution, and the motor is started.

The first impulse of the rotation will cause the paddle, and therefore the recording arm, to swing somewhat beyond the equilibrium position, but this is corrected in a few seconds. Assuming no appreciable thixotropic effects, the consistency as recorded on the chart will level to its final value in perhaps 1 min. or less, and long-continued measurement will not change this value unless the temperature of the liquid is altered. A typical chart obtained with a liquid whose consistency is independent of time or previous history is shown in Fig. 2. It should be noted that the chart paper available during this study was not designed for the recording viscometer, and therefore the arc of the pen does not correspond to the constant time arcs on the chart. Also, 2 min. on the chart represents only 1 min. of elapsed time. Suitable charts are now being prepared for use with the instrument.

Calibration

Recording viscometer consistencies were obtained on a large number of paints as well as on several viscous oils, using 200-r.p.m. speeds. The same materials were then measured on the modified Stormer viscometer, and the weights required to give 200 r.p.m. were obtained accord-

Fig. 4. Calibration of recording viscometer.

ing to the A.S.T.M. Standard Method of Test for Consistency of Enamel Type Paints (D 562-41).[7] Upon plotting these data against each other, it was found possible to draw a smooth curve which expresses the relationship between recording viscometer chart units and Stormer grams per 200 r.p.m. (Fig. 3). This relation is plotted to scale in Fig. 4.

From the Stormer grams per 200 r.p.m., Krebs units can be obtained,[5, 8] and these values were plotted against recording viscometer chart units in Fig. 4. Also, by the application of a correction for energy losses,[8] it is possible to calculate the absolute viscosity in poises from Stormer grams per 200 r.p.m. Such values (approximate because of assumption of 1.0 for density of all liquids used) are likewise plotted on Fig. 4. In order to check the validity of this calibration, the viscosity of four oils was measured on both the modified Stormer and the recording viscometer. The results listed in Table I show that the calibration is sufficiently accurate to indicate the consistency range available using a certain spring.

TABLE I.—RECORDING VISCOMETER CONSISTENCY OF VISCOUS LIQUIDS.

Oil	Calculated Stormer Viscosity, poises	Recording Viscometer Chart Units	Viscosity from Calibration Chart, poises
A	6.1	180	7
B	9.8	280	10
C	11.7	320	12
D	40.9	880	41

Consideration of Fig. 4 will show that the recording viscometer, using such a spring, covers a sufficiently wide consistency range to make it applicable to most paint problems. Also, the variation of torque (or chart units) with consistency as measured by other methods is sufficiently close to linearity to make the new instrument suitable over the entire range covered.

Determination of Consistency at Various Rates of Shear

Having shown that the new recording viscometer can be calibrated at 200 r.p.m. in terms of various other types of units, it was then necessary to determine whether similar relations would be found at different rates of shear and whether the instrument could be used to plot stress-strain curves which would provide information concerning flow properties of paint systems. Twenty-two paints were chosen for this purpose. Eight of these (group A) consisted of heavy and medium (brushing) consistency levels in four widely different coating types—enamel, interior gloss, interior flat, and outside house paint. The remaining fourteen (group B) were chosen at random throughout our laboratory and represent several additional paint types. These paints are described in Table II, while the consistency data obtained on the recording viscometer at various speeds are plotted in Fig. 5 to 7. In almost every case, definite curvature toward the torque or "chart unit" axis is noted, particularly at high rates of shear. This is ascribed to greater loss of energy at higher speeds, probably because of the introduction of turbulent flow, just as has been previously noted on the modified Stormer viscometer.[8]

For comparative purposes, the same paints were run on the modified Stormer viscometer at several different rates of shear. The results are plotted in Fig. 8 to 10 and can

TABLE II.—DESCRIPTION OF PAINTS USED IN CONSISTENCY TESTS.

	Paint	Pigment	Per Cent by Weight	Vehicle	Other Materials
Group A	No. 1	Rutile titanium dioxide	27	Long oil modified alkyd	
	No. 2	Rutile titanium dioxide	23	Long oil modified alkyd	Mineral spirits
	No. 3	Titanium-calcium pigment	63.5	Oil modified ester gum maleic type	
	No. 4	Titanium-calcium pigment	55	Oil modified ester gum maleic type	
	No. 5	Titanium-calcium pigment	63	Heavy kettle bodied linseed oil	Mineral spirits
	No. 6	Titanium-calcium pigment	60	Heavy kettle bodied linseed oil	Mineral spirits
	No. 7	Titanium-magnesium pigment 35% Leaded zinc oxide	35 35	Alkali refined linseed oil	
	No. 8	Titanium-magnesium pigment 35% Leaded zinc oxide	32 32	Alkali refined linseed oil	
Group B	No. 9	Anatase titanium dioxide	29	Medium oil maleic type	Calcium linoleate pulp
	No. 10	Anatase titanium dioxide	29	Medium oil maleic type	Mineral spirits
	No. 11	Anatase titanium dioxide	25	Long oil modified alkyd	Zinc resinate
	No. 12	Titanium-calcium pigment Whiting	57 9	Bodied linseed oil	Calcium linoleate pulp Aluminum stearate Zinc resinate
	No. 13	Titanium-calcium pigment Whiting	57 9	Bodied linseed oil	Calcium linoleate pulp Aluminum stearate Zinc resinate
	No. 14	High strength lithopone Anatase titanium dioxide Whiting	53 8 8	Bodied linseed oil	Calcium linoleate pulp Aluminum stearate Zinc resinate
	No. 15	Titanium-calcium pigment Whiting	57 9	Bodied linseed oil	Calcium linoleate pulp Aluminum stearate
	No. 16	Titanium-calcium pigment Fibrous talc	50 12.5	100-gal. limed rosin	
	No. 17	Titanium-calcium pigment Fibrous talc	50 12.5	½—100-gal. limed rosin ½—ester gum	
	No. 18	Rutile titanium dioxide	31	Urea-alkyd	
	No. 19	Rutile titanium dioxide 35% Leaded zinc oxide Fibrous talc	7.4 30 23	Alkali refined linseed oil	
	No. 20	Anatase titanium dioxide 35% Leaded zinc oxide Fibrous talc	9 30 21	Alkali refined linseed oil	
	No. 21	Anatase titanium dioxide	32	Long oil modified alkyd	(Unground)
	No. 22	Nonchalking titanium dioxide 35% Leaded zinc oxide Fibrous talc	11 34 25	Raw linseed oil—bodied linseed oil	

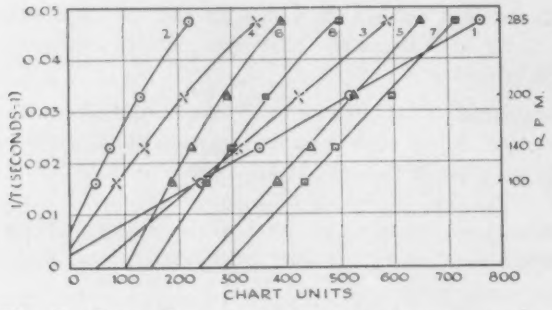


Fig. 5. Recording viscometer consistency curves.

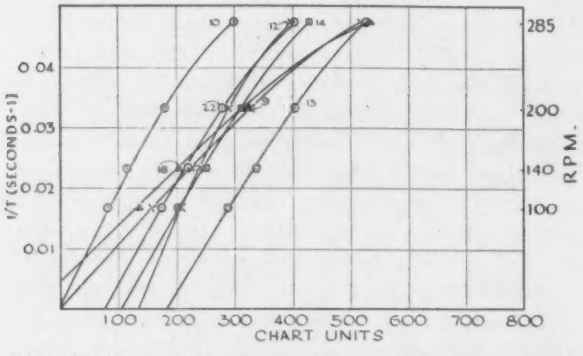


Fig. 6. Recording viscometer consistency curves.

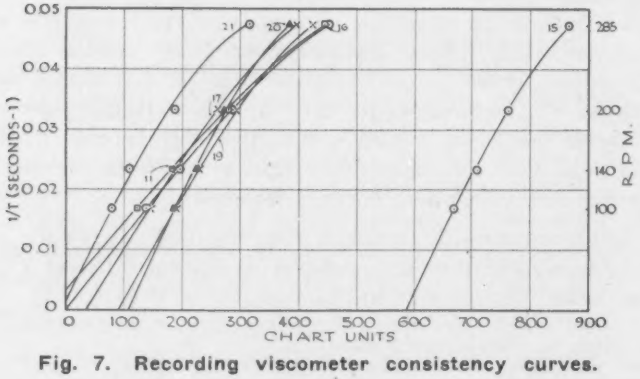


Fig. 7. Recording viscometer consistency curves.

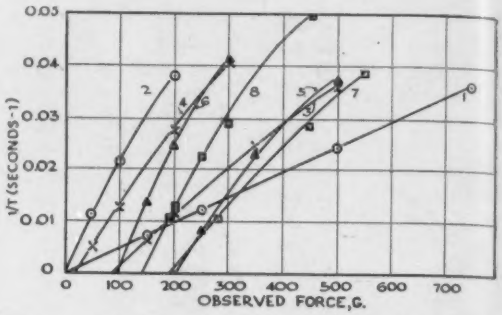


Fig. 8. Modified Stormer consistency curves.

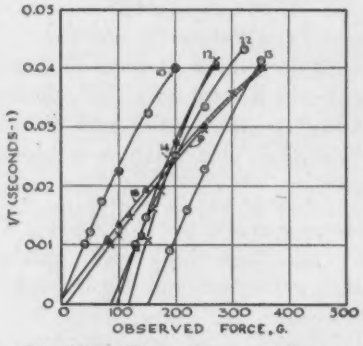


Fig. 9. Modified Stormer consistency curves.

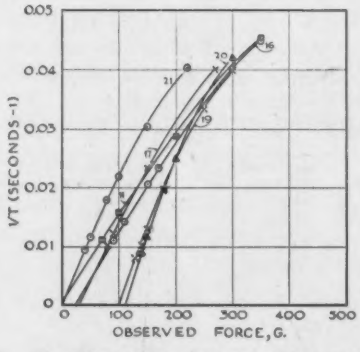


Fig. 10. Modified Stormer consistency curves.

be compared directly with corresponding recorder values. It is obvious that the Stormer and recorder curves are almost identical, which further proves the utility of the new instrument for paint consistency determinations.

To illustrate the correlation more clearly "yield values" (intercept on the chart unit axis) and "mobilities" (slope of the curve from 200 r.p.m. to zero speed) have been calculated and compared with yield values and mobilities similarly calculated from Stormer data, in Table III. These results agree very well, qualitatively at least, and, in addition, the numerical values are almost identical. In other words, the recording viscometer in its present form could be used as a direct replacement for the modified Stormer, without requiring reorientation of the operator's thinking in terms of consistency. If even closer agreement is required, the chart could be printed in a scale reading Stormer grams per 200 r.p.m. directly, for example, rather than in its present linear scale.

Figure 11 indicates the type of plot obtained on a normal paint at various speeds. This shows the constancy of torque at a given speed, regardless of whether this speed is approached from the high or low side.

Consistency—Time Relations

One of the principal advantages of the recording instru-

TABLE III.—COMPARISON OF MODIFIED STORMER AND RECORDING VISCOMETER CONSISTENCIES

Paint	Recording Viscometer		Modified Stormer Viscometer	
	Yield Value	Mobility × 10^4	Yield Value	Mobility × 10^4
No. 1	(0)	0.59	0	0.49
No. 2	(0)	2.30	0	1.96
No. 3	45	0.87	80	0.90
No. 4	(0)	1.51	20	1.51
No. 5	255	1.21	200	1.41
No. 6	105	1.85	95	2.22
No. 7	295	1.11	180	1.07
No. 8	160	1.67	140	1.87
No. 9	0	1.02	10	1.22
No. 10	0	1.91	0	2.14
No. 11	(0)	1.10	(0)	1.39
No. 12	135	2.16	115	2.97
No. 13	185	1.52	155	2.23
No. 14	100	1.60	100	2.46
No. 15	590	1.91	(Could not measure)	
No. 16	0	1.16	25	1.55
No. 17	40	1.49	30	1.85
No. 18	(0)	0.98	0	1.19
No. 19	95	1.72	100	2.22
No. 20	110	2.03	110	2.56
No. 21	(0)	1.81	0	2.00
No. 22	80	1.63	90	2.14

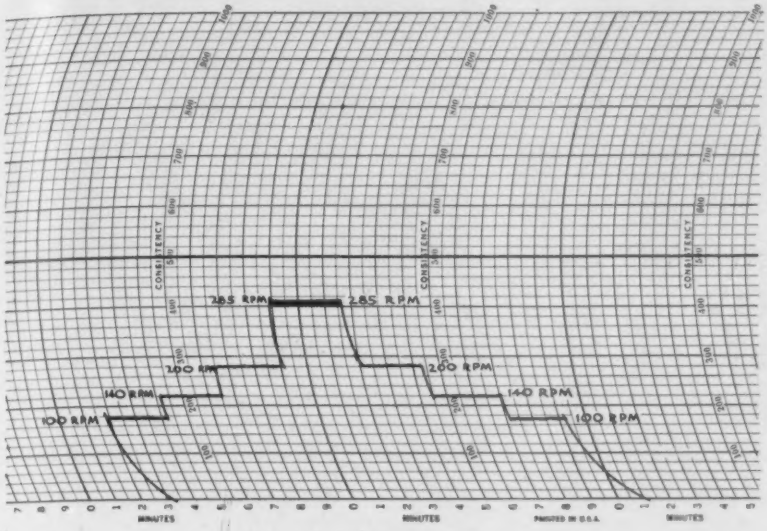


Fig. 11. Normal paint at various speeds.

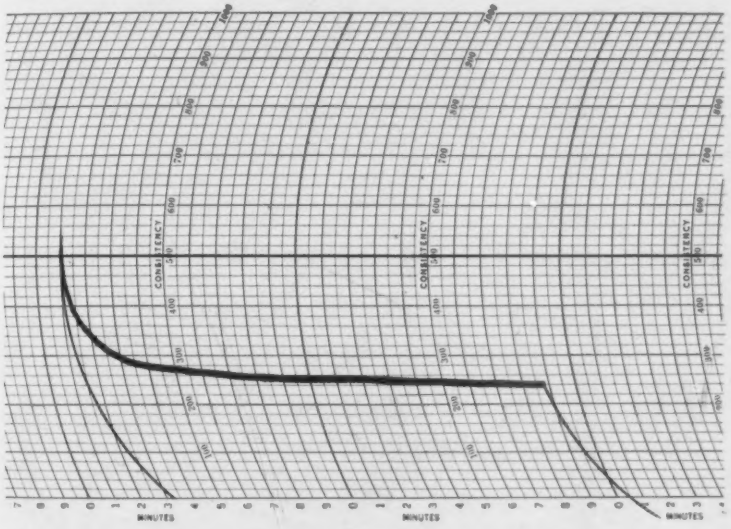


Fig. 12. Thixotropic paint at 100 rpm.

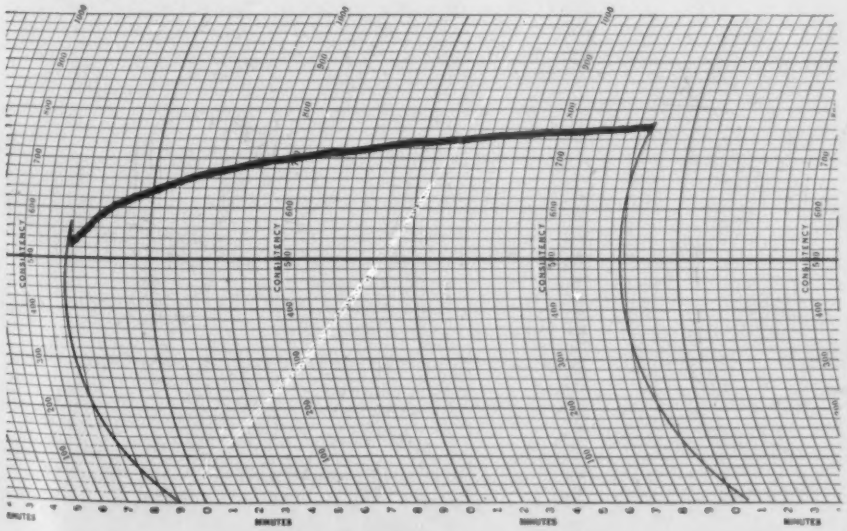


Fig. 13. Rheopectic paint at 200 rpm.

ment is the ability to provide a continuous record of the consistency of a material over a period of time. Conditions under which this feature is particularly useful include:

1. Bodying of water-sensitive pigments.
2. Change in structure of paints by agitation:
   (a) Thixotropy—decrease in consistency.
   (b) Rheopexy—increase in consistency.
3. Effect of added materials, including bodying oils and thinners.

To illustrate the manner in which these effects might show up on the recording viscometer, three charts are presented. Figure 12 shows the decrease in consistency of a lithopone-low acid vacuum bodied linseed oil upon agitation at 100 r.p.m. (thixotropy). The initial consistency decrease is seen to be much larger than that observed for a normal paint (Fig. 2), and the equilibrium consistency value is approached more slowly. The modified Stormer and most other commercially used viscometers could not be used on a paint of this type, since continuous agitation is required to reach an equilibrium consistency. Measurements on these instruments would be erratic, and the values obtained would depend upon the time elapsed between successive observations.

Figure 13 illustrates the somewhat less familiar phenomenon of rheopexy. A titanium dioxide-calcium carbonate-low acid number linseed oil was tested at 200 r.p.m. The consistency was found to increase very appreciably, and was still rising somewhat after 11-min. agitation.

Figure 14 shows the effect of 1 per cent soap solution in a titanium dioxide-calcium carbonate-long oil ester gum system. The soap solution was stirred in by hand for approximately 5 min., and the paint was then placed on the recording viscometer. The consistency at 200 r.p.m. is seen to rise very rapidly from the low initial value, and is still increasing after 15 min., although the rate of increase has slowed appreciably. This chart, of course, can be continued until equilibrium consistency is reached.

Speed of Operation

Laboratories which make a large number of consistency determinations per day will be interested in the relative times required for such measurements on the new recording and on the modified Stormer viscometer. To check this point, observations were made on ten paints, by four observers, three of whom were skilled in the use of the modified Stormer, while none had any experience with the recording viscometer. The times required to make these consistency determinations (Stormer

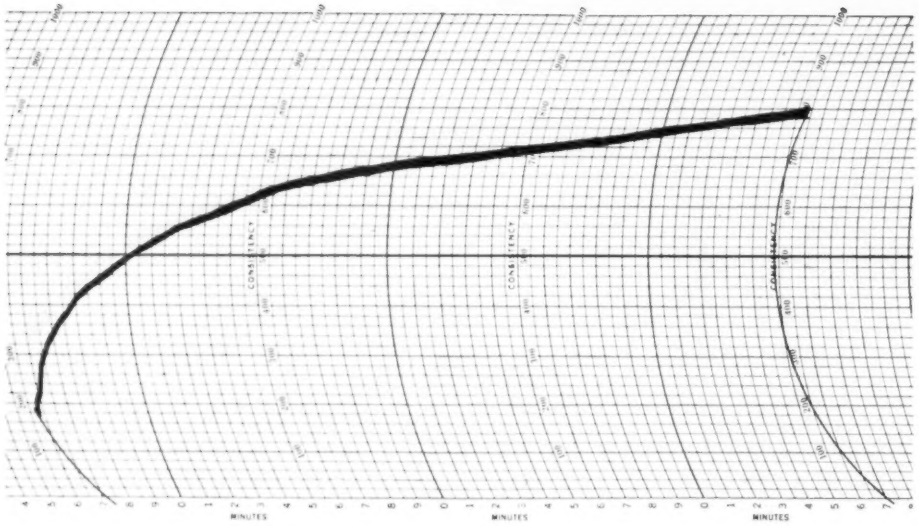


Fig. 14. Effect of soap solution in paint at 200 r.p.m.

grams per 200 r.p.m. or Krebs units in one case, recording viscometer chart units in the other) were averaged as shown in Table IV.

TABLE V. TIME REQUIRED FOR TEN CONSISTENCY MEASUREMENTS

Number of Observers	Average Time, min.			
	Modified Stormer Viscometer		Recording Viscometer	
3	Skilled	34	Unskilled	27
1	Unskilled	75	Unskilled	35
4	Average	44	Average	29

It is evident not only that an appreciable saving in time can be obtained on the recording viscometer, but also that less skill is needed on the part of the operator.

1. Research Chemists, Pigments Dept., E. I. du Pont de Nemours and Co., Inc., Newport, Del.
2. H. A. Gardner, "Physical and Chemical Examination of Paints, Varnishes, Lacquers, and Colors," Ninth Edition, Second Printing, p. 224 (1940).
3. H. A. Gardner, "Physical and Chemical Examination of Paints, Varnishes, Lacquers, and Colors," Fifth Edition, pp. 259-261 (1930).
4. H. A. Gardner and H. C. Parks, "Consistency of Paints, Enamels, and Pigmented Lacquers," *Circular No. 265*, Paint Mfrs. Assn., pp. 414-428 (1926).
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(Reprinted with permission from January, 1943 ASTM Bulletin.)

First of a series of articles on the preparation of metal surfaces for protective finishes

ALROK TREATMENTS

OF ALUMINUM AND ALUMINUM ALLOYS IMPROVED BY ACP DEOXIDINE PROCESS

It has recently been established that the appearance as well as the effectiveness of Alrok coatings can be greatly improved by the use of **DEOXIDINE**, a phosphoric acid type cleaner, instead of the alkali solutions formerly used to prepare the aluminum and aluminum alloy parts for the treatment. **DEOXIDINE #170** for immersion processes and **DEOXIDINE #10E** for spray operations are used in water solutions in accordance with regular metal cleaning practice.

Aluminum oxidizes rapidly; but, unlike steel, the resultant oxide forms a protective coating that retards further corrosion. In the Alrok process, a uniform oxide coating is developed, chemically, which both protects the metal and changes and improves its appearance. The object and benefit of the Alrok process is to obtain a uniformity of the oxide coating. In order to secure this, it is absolutely necessary to have a precleaning system that will present uniform, chemically clean, and receptive surfaces to the oxide-forming baths.

Alkali cleaners which, generally, for this purpose are inhibited with sodium silicate, produce a surface that retains traces of silicate and this results in irregularities in the surface appearance of the Alrok coating. In certain instances, the formation of the Alrok coating is completely prevented.

In some plants the alkali cleaning operation is followed by a water rinse after which the parts prior to Alroking are etched in a heated chromic-sulphuric acid bath for from 3 to 5 minutes and again rinsed in water. The resultant Alrok coating contains sulphate ions ($SO_4^=$), traces of which remain on the surface as a result of the chromic-sulphuric acid pickle. While a uniform Alrok coating is thus obtained, these traces of sulphate ion are detrimental, since they accelerate corrosion and hence will adversely affect the life of any subsequent paint finish.

The Deoxidine process in preparation for Alroking combines the cleaning and etching operations in one solution, thus greatly reducing the time required and increasing the production capacity of the finishing department. The cleaning and the more uniform etching is more effectively accomplished without objectionable or corrosive fumes and, after a water rinse, the parts take a more uniform and durable Alrok coating. The trace residues of the Deoxidine process (phosphates, if left) are anti-corrosive agents that improve rather than impair the life of paint finishes subsequently applied.

The success of Deoxidine for cleaning aluminum and aluminum alloys is but one example of the successful use of Deoxidine for cleaning metals (except zinc and cadmium) in properly preparing them for paint. The thorough cleaning is chemical as well as mechanical and residues, if left, are beneficial to paint life rather than harmful. There are various grades of Deoxidine adapted to the various methods of application and different conditions of the surface.

NEW EQUIPMENT AND SUPPLIES

LATEST COMMERCIAL DEVELOPMENTS IN ORGANIC FINISHING

New Nitrocellulose

Hercules Powder Co., Dept. OF, Wilmington, Del., has announced a new grade of nitrocellulose having greater solubility in alcohol. Requiring a minimum of ester solvents, Hercules SS nitrocellulose is said to be finding wide application in the production of high-quality lacquers. Tests indicate that this nitrocellulose, which is available in four viscosities (¼, ½, 5-6, and 40-60 seconds), can be used in wood sealers, wood lacquers, printing inks, heat-sealing adhesives and for other special uses.

Tests conducted over the past year have determined the solubility of SS nitrocellulose in a variety of solvent mixtures comprising large proportions of alcohol, or alcohols with minor proportions of an aromatic hydrocarbon and an ester solvent—ethyl acetate. Triangular diagrams charting these results are available upon request to the manufacturer.

It was found that the small amount of ester solvent required to dissolve SS nitrocellulose, produces lacquers that will spray satisfactorily under average conditions without blushing and dry with very little orange peel or other imperfections, the company stated.

Hercules reports that SS lacquers possess the same properties of standard nitrocellulose lacquers, including quick-dry, flexibility, toughness, durability, and chemical resistance. Based on the relative supply picture of alcohol and of ester solvents, SS nitrocellulose is believed to have good postwar prospects.

Size Coating

Swift & Co., Glue Div., Dept. OF, Union Stock Yards, Chicago, Ill., are the producers of plasticized and liquified protein compounds suitable for sizing wood, paper, etc., preliminary to the application of lacquers. These materials, of which the company's Evertack Liquid Glue is a typical example, may be applied by brush or spray and are said to produce a sealing film which is resistant to oils, solvents, etc., and which reduces the amount of lacquer required to finish a porous surface.

The company states that Evertack Liquid Glue is now being used as an undercoat for lacquer in the pencil trade, as a sealing compound in the folded seams of steel solvent drums and as a seam dope in the manufacture of fibre cans.

Further information on these plasticized protein materials may be obtained by writing to the company at the above address.

Roof Coating

A new roof coating, Plastikroof, has been announced by the Evercrete Corp., Dept. OF, 19 West 44th St., New York 18, N. Y.

This roof coating is said to be waterproof, resistant to fire and impervious to acid fumes and salt atmosphere. It may be applied to any surface, wet or dry, and contains no solvents. It is claimed that it will retain its original elasticity under the most severe conditions of climate, outlasting any bituminous coating. Plastikroof is available in red, green and black.

New Spray-Degreasing Booth

A new spray-degreasing booth just announced by The DeVilbiss Co., Dept. O.F., Toledo, Ohio, is reported to combine those features which have proved themselves most desirable in hundreds of units built by this manufacturer for industry and the armed services during recent years.

In view of the war-born shortage of organic solvents of the type used in degreasing operations, one of the most important of the advantages claimed for this new spray-degreasing booth is the ability to hold solvent loss to barest minimum. Engineered for safe operation, even when hazardous materials of high volatility and very low flash-point are used, the new unit also removes fumes more thoroughly and delivers a more forceful, harder-driving solvent spray, according to reports.

The booth is made in 14, 16, and 18 gauge steel. Sizes vary according to the requirements of the products to be handled.

Paint Brush Renewer

Prestorer, a liquid paint brush cleaner, is manufactured by Technical Development Laboratories, Dept. OF, P. O. Box 65, Tenafly, N. J. This cleaner is said to be nonflammable, non-toxic and harmless to the skin and to safely remove paint, shellac, casein, creosote, coal tar and kalsomine from the most costly brushes without injuring the bristles or affecting the settings.

According to the manufacturer, the cleaner acts by soaking into the bristles and swelling them so that the old paints crack off. On drying, the bristles return to their normal size. The cleaner may be reused many times if it is kept clean by filtering through cheesecloth.

Box-type Oven

The Industrial Oven Engineering Co., Dept. OF, 11621 Detroit Ave., Cleveland, O., is now producing a standard box-type oven in several standard sizes for a variety of batch heating purposes. It uses any commercial oven fuel including electricity. Door sizes range from 3 feet wide by 5 feet high to 5 feet wide by 7 feet high, with working depths from 4 to 10 feet.

Heating equipment is built into the oven shell, and the oven is shipped assembled, ready to operate except for the attachment of accessories. Ductwork is likewise built in, and is arranged for cross flow and vertical air passage, affording positive and rapid circulation through a relatively dense work load. Recirculation and exhaust ducts are arranged to prevent belching or leaking at the door opening.

One of the principal features of the oven is close temperature tolerance within limits from 200 to 1000° F. On high-temperature units, inside panels are made of steel plates with heat affected parts of chrome and chrome-nickel alloys. Ovens can be furnished with or without positive exhaust fan systems, depending on the processes for which they are to be used.

Standard temperature controls are expansion recording thermometer type or millivoltmeter type, depending on accuracy of control required. Full electric safety equipment protects the system against flame, current or air failure.

These ovens can be used with trucks or racks for steel strip dehydrogenizing, aluminum heat treating, stress relieving of N.E. alloys, metal finishing, curing of synthetic resins, tempering and blueing of steel parts, and a number of other miscellaneous applications.

Patents

Paint Brush

U. S. Pat. 2,336,419. V. Pino, Dec. 7, 1943. A self-feeding paint brush comprising a casing having a paint passage extending to its front face, a valve for controlling said paint passage, a container for paint connected with said paint passage, a paint distributing member mounted on said casing and connected to receive paint from said passage, a handle for conveniently manipulating said casing, and paint spreading and finishing rollers mounted on said casing above and below said distributing member, and means for extending and retracting said distributing member controlled by turning said handle, comprising a horizontal stud carrying said paint distributing member, and a transmission system between said stud and handle for conveying rotations of said handle to said stud to cause said paint distributing member to be retracted.

Water-Base Paint

U. S. Pat. 2,338,580. C. R. Fordyce, assignor to Eastman Kodak Co., Jan. 4, 1944. A water-base paint composition adapted to form a coating upon a surface which upon standing becomes a washable protective layer over said surface, which composition essentially consists of a water solution of an ammonium salt of a phthalic acid ester of cellulose having a phthalyl content of at least 20% and 3—10% (based on the weight of the ester) of a water insoluble pigment.

Spray Booth

U. S. Pat. 2,337,983. E. F. Fisher, Dec. 28, 1943. A spray booth comprising the combination of a spray chamber, a liquid collecting chamber, a passageway connecting said chambers, said passageway including at least one aspirator tube, and spray means for directing a liquid spray through the aspirator tube into the liquid collecting chamber, for creating a concurrent gas flow from the spray chamber through the passageway and aspirator tube into the liquid collecting chamber.

Organic Coating

U. S. Pat. 2,337,424. R. R. Stoner, Jr. and G. W. Seagren, assignors to Stoner-Mudge, Inc., Dec. 21, 1943. A thermally stable and corrosion-inhibitive coating composition for metals, adapted to be applied and thereafter baked at temperatures exceeding 225° F., in which the film-forming solids comprise at least 50 per cent of a chlorine-containing thermoplastic resin in which the chlorine atoms are attached to carbon atoms in aliphatic chains and which normally decomposes to liberate deleterious amounts of hydrochloric acid under conditions of the bake, containing from 0.5 to 10 per cent, based on the total film-forming solids, of a stabilizing and corrosion-inhibitive substance selected from the group consisting of the methyl, ethyl, propyl, and butyl mono-esters of phosphoric acid, together with a solvent mixture for the whole.

Deposition of Coatings

U. S. Pat. 2,337,972. W. Clayton, R. I. Johnson and H. K. Dean, assignors to Crosse & Blackwell, Ltd. (England), Dec. 28, 1943. The process of forming a protective coating on a metal surface, said coating being capable of resisting attack by water at the temperature at which foodstuffs are normally sterilized, which comprises preparing a dispersion of a raw drying oil and an oil-soluble drier in an aqueous alkaline dispersion medium, electrolytically provoking a deposit from the dispersion upon the metal surface as anode to provide an adherent film containing the oil and drier with the oil constituting the preponderant coating component, and then washing, drying and stoving the deposited coating film.

Lacquer

U. S. Pat. 2,338,461. G. Schultze (Germany), vested in the Alien Property Custodian, Jan. 4, 1944. The process for producing coatings which comprises coating a substratum with a solution comprising about 8 to about 12% of (1) chlororubber, about 8 to 16% of (2) a hard resin selected from the class consisting of natural hard resins, phenol-formaldehyde resins, ureaformaldehyde resins and hard resinous polymerization products, about 12% of (3) a substance selected from the class consisting of oil modified alkyd resins, drying oils and blown drying oils and less than 1% of (4) a rubber vulcanization accelerator and heating the coating obtained to a temperature between 160° and 200° C.

Business News

To keep pace with new problems in the metal industries, an organic research laboratory has been opened in the Turco Los Angeles laboratory, according to *S. G. Thornbury*, president of *Turco Products Inc.*, 6135 S. Central Ave., Los Angeles 1, Calif. *Dr. Nathaniel Baum* has been appointed head of the new department.

Dr. Baum came to Los Angeles from Chicago where he had been consulting chemist in organic synthesis and resins for the last six years. He received his doctor's degree in chemistry at Columbia University in 1930.

The business of the *Gehnrich Corporation*, Long Island City, N. Y., for over 60 years pioneers in the development and building of industrial ovens, dryers and air heaters, has been purchased by *W. S. Rockwell Company*, 50 Church St., New York 7, N. Y., and is being operated as *Gehnrich Oven Division* of the latter Company since December 18, 1943.

Under the management of *A. V. Maday* and *A. H. Sherman*, who will retire from active business, the Gehnrich Corporation had become one of the largest manufacturers of batch type and conveyor ovens for heat processing operations in the foundry, metal working and finishing, electrical, chemical and allied industries. Its extensive installations for production of aluminum, aircraft and ordnance have been outstanding achievements in wartime oven engineering.

Charles B. Kentnor, Jr., President of W. S. Rockwell Company, announces that the engineering, manufacturing and sales personnel of the old firm will be retained. It is planned to expand its broad oven service in line with the well-known Rockwell policy and reputation for building industrial furnaces of the finest type for over 55 years. However, the progressive engineering ideas and ideals of Mr. Maday and Mr. Sherman will be carried on under the new management.

S. B. Riazanoff, formerly Plant Engineer of *Republic Aviation Corp.* of Indiana, has joined the New York Office of *Peters-Dalton, Inc.*, manufacturers of Hydro-Whirl dust collectors and water wash spray booths.

Mr. Riazanoff, who has the unique record of having commanded the first naval vessel to be sunk by aerial bomb during World War I, has had a wide industrial experience both technical and practical.

He will be associated in New York with *Mr. A. W. Smart* whom many readers will remember as having been associated with the spray equipment industry since his release from the armed forces after serving overseas during World War I.

Peters-Dalton, Inc. maintain facilities for engineering complete organic finishing systems and dust collecting installations at their New York Office, 370 Lexington Avenue.

Robert W. Kress, formerly with the Research Department of the Follansbee Steel Corporation, Pittsburgh, Pennsylvania, who joined the *Special Chemicals Division* of the *Pennsylvania Salt Manufacturing Company* last November, has been assigned to the Chicago Office of that Company according to an announcement by *William P. Drake*, Manager of Sales. Mr. Kress will assist *Mr. J. W. Manz* in handling sales-service work on Pennsalt Cleaners, Pennsalt Corrosion-Resistant Cements, Pennsalt LF 42 (Lead Fluoborate Concentrate) and other products of the Company's Special Chemicals Division in the Chicago territory.

A recent announcement from the *Chicago Vitreous Enamel Product Co.*, Cicero, Ill., tells of the appointment of *F. L. Meacham* as manager of sales and service.

Mr. Meacham was formerly research chemist and metallurgical assistant at the American Roller Mill Co., Middletown, O. during which time he pioneered and developed sheet metal for the application of porcelain enamel. More recently, he has been with the Frigidaire Division of General Motors Corporation where he held various offices, the last of which was Manager of the War Production Engineering Division, in full charge of all engineering problems in connection with the production of war items manufactured by Frigidaire.

According to an announcement made by *Mr. George A. Martin*, Chairman of the Board of *The Sherwin-Williams Co.*, the directors elected *Charles M. Lemperly* to the office of vice president.

In April 1943, Mr. Lemperly was appointed director of sales and distribution in which capacity he will continue to manage all Sherwin-Williams sales activities.

Mr. Lemperly entered the Sherwin-Williams employ in 1907 during a summer vacation from Williams College, taking what he thought was a summer job as junior clerk in the advertising department. This job proved to be permanent and he filled every job in the department during the next seven years and was made advertising manager in 1914.

In his present capacity of vice president and director of sales, he will continue to supervise all of the company's publicity, advertising and public relations. Prominent among these activities are the "Metropolitan Opera Auditions of the Air" radio program. Within the last month, he sponsored the negotiations for the new radio program, Dunninger the Master Mentalist, which began broadcasting over the Blue Network January 5th, 1944 and features Kem-Tone, one of the company's products.

Mr. Lemperly has been actively identified with all the company's sales plans and campaigns. He is well known in the paint industry and is one of the originators of the "Sell the Surface" Campaign.

Mr. Lemperly has been a leading figure in advertising circles for many years and a member of the Cleveland Advertising Club since 1913. He lives at 21978 Avalon Dr., Rocky River, Ohio.

Obituary

Henry E. Miller

Henry E. Miller, President of the Chicago Wheel & Manufacturing Co., died at his Chicago home on Monday, January 10, after a brief illness.

Mr. Miller was born in 1863 on an Illinois Farm, became an expert machinist, then traveling salesman for the Minnesota Thresher Company. In 1894 he was made Manager of the Chicago Emery Wheel Company, which he later purchased. In 1895 he became President and changed the firm's name to Chicago Wheel & Manufacturing Co.

Mr. Miller introduced a number of important innovations in the abrasive industry. He was one of the first to mount small wheels on steel shanks for use in various professions and trades.

Mr. Miller was one of the founders of the Grinding Wheel Manufacturers Association, and in years of actual experience, was one of the oldest men in the industry. Although the Chicago Wheel & Manufacturing Co. made all sizes of grinding wheels before the war, with full WPB approval, for the duration, all facilities of the Company were concentrated on sizes 3" in diameter and under. The plant today flies the Army-Navy E flag as a result of this concentration of production and its success in normalizing deliveries of its products to essential war industries.

Henry Miller's son, Arthur J. Miller, has been identified with his father in business for many years and will continue to direct the affairs of the Company with the same associates, Irving Danielson, Vice-President and Arthur T. Dalton, Executive Secretary and Director of Sales.

ODDS and ENDS

Each month we look forward to receiving our copy of the *Journal of the Franklin Institute* and each month we marvel at the profundity of the learned scientists and their preoccupation with such subjects as *Velocity and Mass Distributions Resulting from the Lateral Diffusion of a Current in a Stratified Medium on a Rotating Earth.* Sometimes we come across an article that is written down to our level, that is, with equations no more involved than the A+B=C type, and, proud of our mathematical ability, we read further with some degree of appreciation of the subject matter.

After perusal of a paper by P. G. Nutting in the current issue, however, we are ready to agree that a little knowledge may be a dangerous thing. In fact, we would add that it is a terrible responsibility. The author demonstrates that, at certain concentrations, acid solutions become more acid *when alkali is added.* And that is not all!! *Many solutions give from 2 to 6 definite and repeatable pH readings,* some of which do not vary with dilution. What is there left to hope for, now that all faith in our pH meter is gone? And whenever we wish to neutralize an acid, how will we ever be certain now that alkali and not acid should be added? The situation has us worried!!

Salt Spray Testing Dep't:

There is romance in the salt spray chamber according to an item which we read in a recent issue of a house magazine. The item, entitled *"Salt Spray Chamber A Weapon Of War"* and with the name of the company deleted, reads as follows:

Bermuda, Trinidad, and the subtle charm of the South Sea Islands. Famous vacation spots where enchanting folders lured you to relax in the twangy salt breezes. Today, the world is at war and it's quite a different story. Tiny romantic ocean islands have changed into Islands of War and those fine salt-laden breezes are deadly enemies to equipment of war. They corrode metal. Like tiny gremlins they work their havoc, and suddenly a vital radio message fails to get out across the air waves. Demon salt has done his work well for Mr. Hitler.

War bound ——— equipment must not fail. The message must go through. So ——— starts the fight with old man salt before he draws a clenched fist.

A clever "Salt spray Chamber" fights the battle before the parts ever near the oceans. In a scientifically designed box, salt laden air is manufactured right in ———'s own plant. The salt content is heavier than in the spray that nature compounds.

Under terrific air pressure and moist heat the tiny pieces of metal used in radio equipment for our men in the Service become salt crusted. Many hours later they are removed and minutely examined for rust and other metal changes which might interrupt radio messages.

After passing this rough test, and only then, is a bolt, nut or any other metal part good enough to be built into ——— equipment. It must be the best we know how to make.

So far as we are concerned, salt spray testing is still a messy business. And if terrific air pressures are used, as the author states, we are prepared to take literally his statement that salt laden air is manufactured right in the company's own plant.

Credit Dep't:

For weeks we have been coming across a photo, in various periodicals, taken in the Forest Park, Ill., plant of American Can Co. and in every case the caption stated that the articles shown in the photo were torpedoes even though they were obviously not complete. A tip of the hat goes to *Steel Horizons* for being the only paper we've seen which correctly captioned the photo as showing only tail cone and after-body assemblies, not the complete torpedoes.

And Bethlehem Steel is to be credited with the unusual statistical note that America at War uses, 5,910 bolts, nuts and rivets every second. Did we hear anyone demand a recount??

Slogan of the Month:

Buy a Bunch of Bonds
To Buy a Bunch of Bombs
To Bomb a Bunch of Bums